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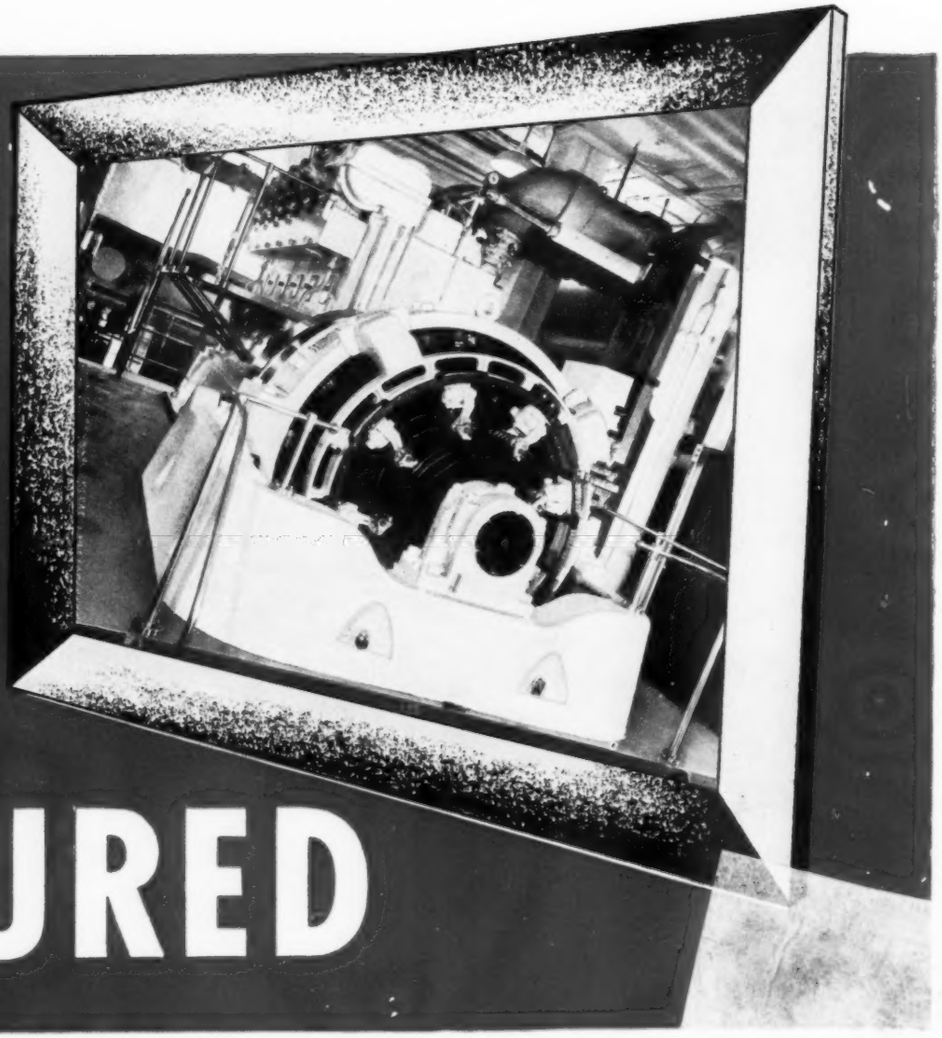

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OCTOBER CONTENTS

Paulding, Ohio 41
Trouble Shooting With An Indicator 44
Diesels Speed Mountain Roadbuilding 47
Alco Announces New 6000 H.P. Diesel Locomotive 48
New Diesel Dragger 51
The Pacific Trolling Fleet 52
Treatise On Lubricant 58
New Haven "Comet" Repowered 60
Saga Of The Submarine "Tench" 62
Diesels Break Soil For Crops 66
New York's New Diesel-Electric Ferry 70
Diesels On Railroads—A Paper 73
Vanderbilt Yacht 74
Supervising And Operating Engineer's Section 78
Exchange Your Diesel Maintenance Ideas Section 80
New 2-cylinder, Opposed Diesel 98

Front Cover Illustration: Typical of the famous Gulf shrimp trawler fleet is the "Pearl M." She is powered with a General Motors 6-71 Diesel installed by Stewart & Stevenson Services.

Table of Contents Illustration: A strip mine scene near Lebo, Kansas. These Caterpillar Diesel tractors are seen; one removing overburden, the other two at work breaking out and removing the coal.

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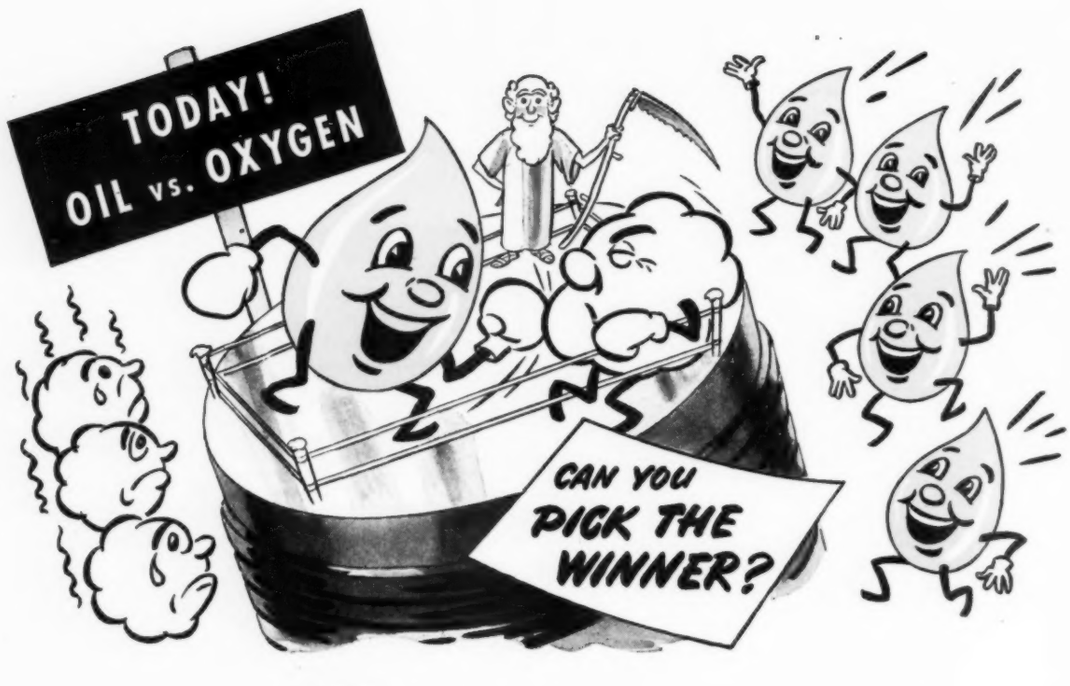

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SHELL

SHELL DIESEL LUBRICANTS

PAULDING DISCARDS ITS ANTIQUES

By HENRY J. BARBOUR

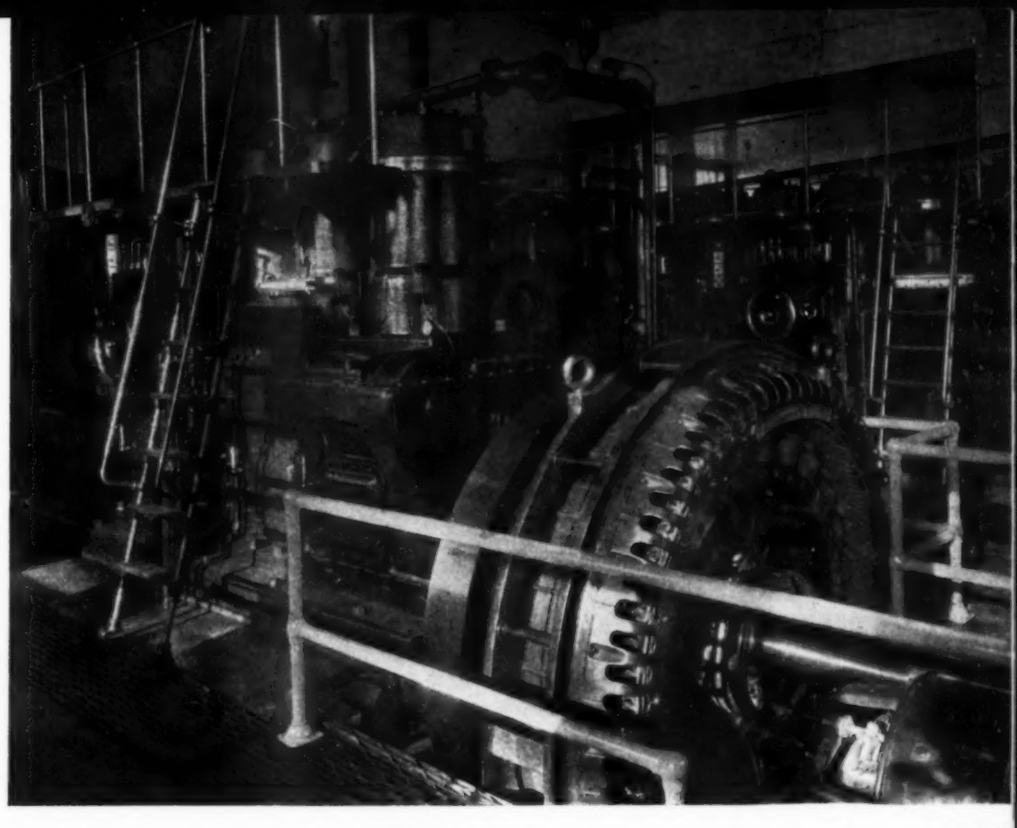
THE citizens of Paulding, Ohio, had been very proud of their municipal power plant, a pride that dated back to the day in the past when their first steam power plant was installed. It served them well and long.

But the time was to come when the plant would show its age and new power generating methods would gradually be able to tuck Paulding's plant into an antique's niche.

Townspeople realized it quickly enough when the time came because as surrounding towns lowered their power rates, Paulding could afford no such reduction without going in the red. The town fathers decided that a change was needed and actually got busy. They toured the country-side with wide open eyes, investigating power plants of every description and when they were finished they tabulated their findings and Diesel won as the only prime mover which would enable the town to supply low cost power and still allow the plant to retire the debts incurred by such an improvement.

In the face of some sturdy opposition which favored steam, the officials decided to install one 400 kilowatt Diesel generating unit to prove the economy of the Diesels to the doubting Thomas's. After the bids were in and studied the Fairbanks-Morse offer was chosen and by February 12, 1940, the first unit was installed and in operation. After one month's operation and an actual saving of $800 in fuel costs, the skeptics were convinced and it was decided that an additional 600 kw. generating unit should be purchased and that the use of the steam plant for stand-by duty should be discontinued as the maintenance and fuel costs of that unit could be utilized to pay for a new Diesel unit. Fairbanks-Morse installed the new unit.

Records indicate that sound judgment was exercised. Fuel costs dropped from 1.145c kwh. to 0.48c per kwh. and at the end of the first year after the payment of all operating expenses the revenue of energy sales totaled $21,381.46.



Fairbanks-Morse 5 cylinder, 2 cycle, 600 hp. Diesel engine and 400 kw., 2400 volt A.C. generator in Paulding plant.

Paulding's old plant which now houses the modern Diesel electric equipment, that has saved the taxpayers' money.

View of 840 hp. Diesel generating unit. It is a Fairbanks-Morse 7 cylinder, 2 cycle, 300 rpm. engine. Other engine is seen in background.

KAISER LIGHTWEIGHT COACH

HENRY KAISER recently pulled another marvel from his inexhaustible bag of tricks with the new aluminum-magnesium luxury liner which seems destined to revolutionize highway passenger transportation. Built especially for the Santa Fe Trailways, the new Diesel-driven coach is now being given exhaustive tests.

The body construction of the Kaiser Coach features the exclusive use of magnesium and aluminum, and the coach is powered by a six-cylinder, 275 horsepower supercharged Cummins horizontal Diesel engine located under the floor midway between front and center wheels. A low center of gravity is obtained by location of the motor, baggage compartments and air conditioning equipment under the floor, and is further augmented by the use of so much magnesium in the upper body.

General specifications are: weight, empty, 28,000 pounds; weight, loaded, 34,000 pounds; height from road, eleven feet; length, sixty feet; width, ninety-six inches; inside height, six feet, eight inches; seats, double, forty-seven inches; single, twenty-six inches. There are forty inches between seats instead of the customary thirty-five inches. The Kaiser Luxury Coach has been specially built for Santa Fe to seat forty passengers, but by using the normal thirty-five inch space between seats and by removing lavatories, a payload of sixty-three passengers may be accommodated. On this basis, the Kaiser's weight of 28,000 pounds and passenger payload of sixty-three, as against the average bus' weight of 22,000 pounds and capacity of thirty-seven, allows an increase of seventy per cent in passenger payload with only twenty-seven per cent gain in weight.

The Kaiser Coach has three sets of wheels, two singles in front, two pairs of duals center (driving axle) and two singles in the rear using tires 1100 x 22. The front wheelbase is 258 inches, rear 282 inches. Although the coach is sixty feet long it is as easily manipulated as the present pleasure cars. No more street room is required to turn a corner than is used by the standard thirty-five foot long bus. This is accomplished by a patented steering system which automatically steers the rear wheels when the front ones are turned, and is controlled by the articulated joint, which makes the rear axle track with the center axle. The turning radius is thirty-eight feet.

The end of the rear compartment is arranged as an observation section and the large windows and extensive aircraft-type windshields afford all passengers an excellent view. Although complete air conditioning makes it unnecessary, the windows open by sliding horizontally. All windows are laminated safety glass set in polished aluminum frames. In the event of damage, the glass in any window may be replaced in five minutes.

Illumination at night is furnished by four half-round translucent plastic panels extending the full length of the coach, and give the impression of long tubes of light. In all, a total of 624 panel lights are controlled by the driver. Head and fog lights are of sealed beam type and marker lights are extra large with plastic lens.

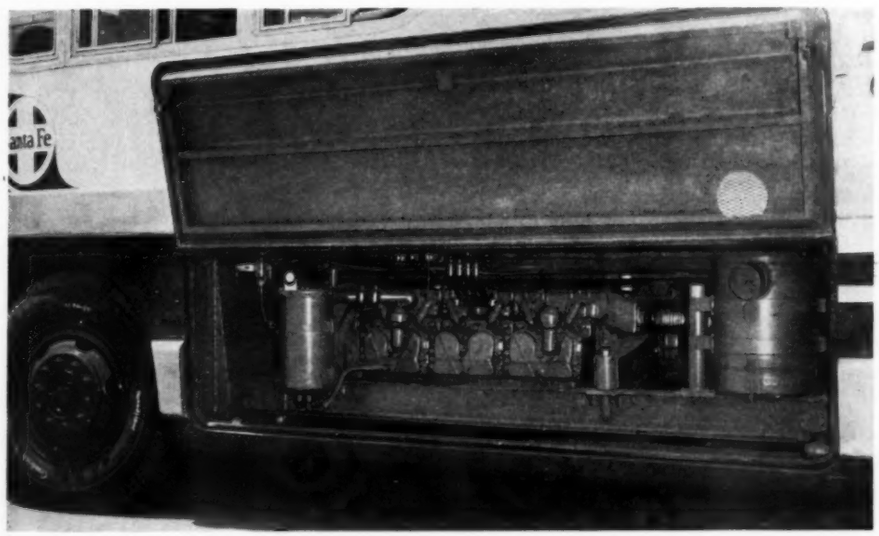
The luxury liner's seats are of extra width and have surplus leg room. They are equipped with deep foam rubber cushions which are soft, form fitting and have comfortable head rests with attachments for fresh linen covers. The backs are upholstered and will recline to any desired angle. An adjustable footrest is provided. The seats are mounted on swivel bases and if the traveler wishes to face the window and enjoy the passing terrain, he may.

New 60-foot, aluminum-magnesium bus built by Henry J. Kaiser for Santa Fe Trailways.

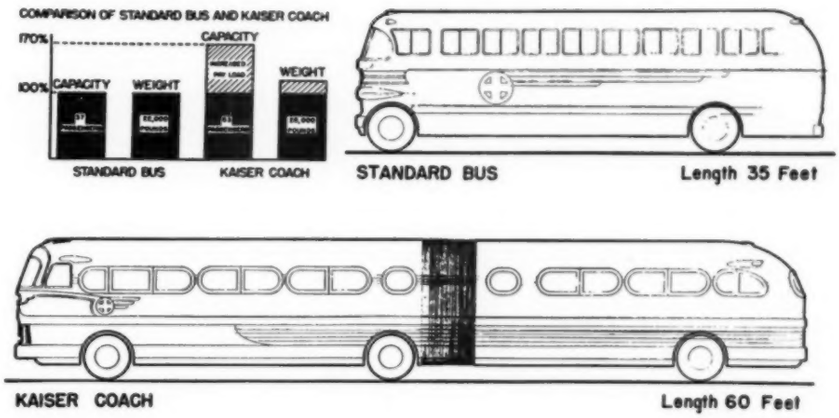
DRIVEN BY 275 HP DIESEL ENGINE

Two lavatories are provided for the convenience and comfort of the traveler. Wash basins are of stainless steel and provide hot and cold water. The toilets are also of stainless steel, flush type and foot lever control. This innovation in motor coach equipment allows the operator to run faster schedules.

A balanced floating ride is another feature of the Kaiser Coach through the individual suspension of the wheels by a new rubber torsion spring. All of the unevenness in the highway surface is absorbed by the rubber in torsion. In addition, a combination hydraulic shock absorber is provided to lessen the sudden shock of chuck holes. These springs are known by the trade name "Torsilastic."



View of Cummins Diesel installation for new bus. It is a 6-cylinder, supercharged, horizontal type Diesel which develops 275 hp. at 2100 rpm. The unit is removable for maintenance purposes.



Illustrative chart above shows comparative weights, sizes and capacities of Kaiser and standard coaches.

Power for the Kaiser Coach is provided by a 275 hp. 2100 rpm. supercharged six-cylinder Cummins Diesel engine. The engine is of horizontal type and was built for this vehicle. The excessive horsepower, coupled with the light weight of the vehicle, gives it pleasure car performance. It has a syncro mesh overdrive transmission with four speeds forward. First gear ratio is 3.72, second 1.86, third 1.00, and fourth .76. The reverse gear ratio is 4.12. Governed speed is 2100 rpm. For additional weight reduction, the lower crankcase is made of aluminum.

Water pump capacity is seventy-five gallons per minute at 2100 rpm. Exhaust manifold is also of aluminum and water-cooled. The fuel system consists of one one hundred-gallon tank and one eighty-gallon tank located under the floor, in the rear of the coach.

The engine compartment is located under the floor midway between front and center wheels. Dirt, which ruins so many engines, is prevented from entering the compartment by fresh clean air drawn through the radiators, which are mounted in the front end of the coach and force air into the engine compartment. This air pressure also prevents dust and dirt from the road from entering the underside.

The brakes are air-controlled, the clutch and throttle hydraulically operated, and the front door is air-operated. All of the electric switches for the control of lights, air conditioning, fuel pumps, etc., and the speedometer, tachometer, air pressure gauge and other instruments are located directly in front of the driver, thus making it unnecessary to take his eyes from the road while reading instruments or manipulating switches.

Ease of maintenance is one of the striking features of the Kaiser Coach. The power plant and transmission are mounted in a roller carriage which can be disconnected in a few minutes and the two units rolled out of a large door in the side of the coach. Minor repairs can then be made and the unit rolled back, or if a major overhaul is necessary, a spare unit can be rolled in to put the coach back in service in less than one hour. Batteries are mounted in a tray which in turn is mounted on rollers, and can be rapidly rolled out for checking or recharging. The air cleaner and oil filter are conveniently serviced through the engine compartment door in the side of the coach.

Designed by two brothers, V. F. and M. G. Antoine, who have developed patents on many of its features since 1937, the Kaiser Coach was "tailor made" by workmen at Permanente shops. Magnesium and aluminum plates and sheets used in the body construction were fabricated on the job.

TROUBLE SHOOTING WITH AN INDICATOR

By DR. P. H. SCHWEITZER, *The Pennsylvania State College*

PART I

THERE is no single record which gives more information about a Diesel engine than an indicator card. Troubles can be most precisely diagnosed with it. Why then is it not used more? One reason is that the old fashioned pencil type indicator was found unsuitable for high speed engines. Fig. 1 shows the principle of a pencil type indicator.

The vertical travel of the pencil is proportional to the cylinder pressure, the horizontal travel of the drum (represented in the schematic sketch by a board) to the piston stroke. Fig. 2 shows a modern indicator using that principle. By reducing the weight of the reciprocating parts and refinements in design this type of indicator may be safely used up to 500 rpm. Beyond that the mechanical indicators are unsatisfactory. However, this difficulty is being overcome by the development of dependable electrical indicators of which the cathode ray indicator, pictured in Fig. 3 is an example.

The balanced pressure type indicators of which the Farnborough type (Fig. 4) is a well known example, is another electrical indicator suitable for any speed encountered in Diesel operation.

There is, however, frankly speaking, another reason for the inadequate use of the indicator cards in engine work, and that is that the operators don't know how to read them. That is

Fig. 1

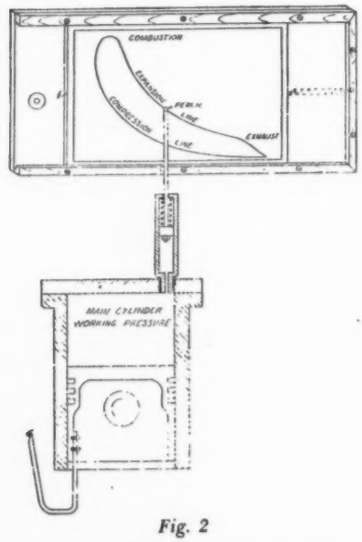


Fig. 2

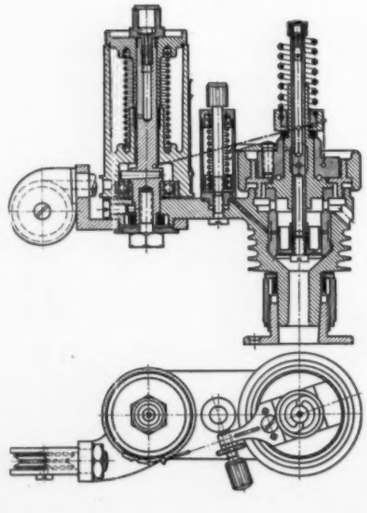


Fig. 3

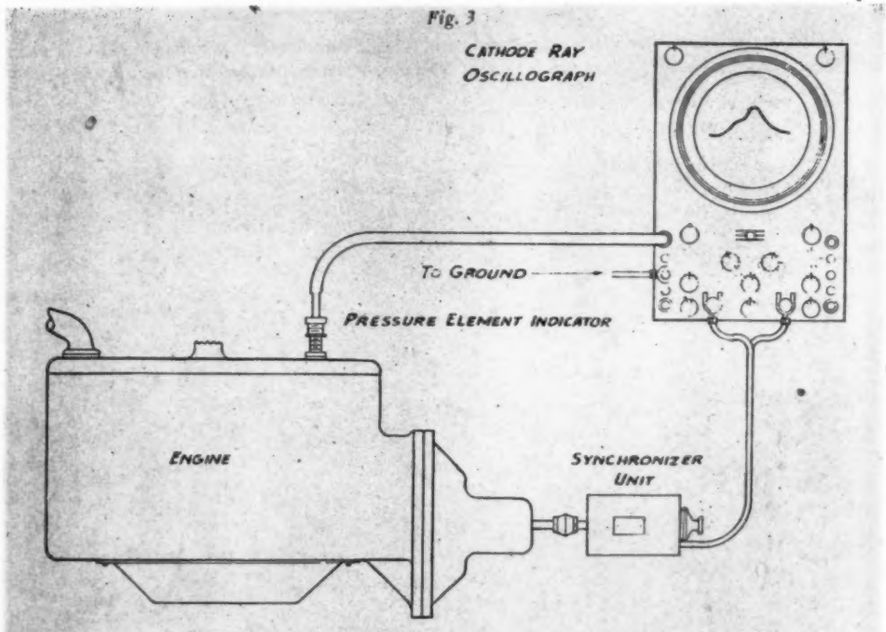
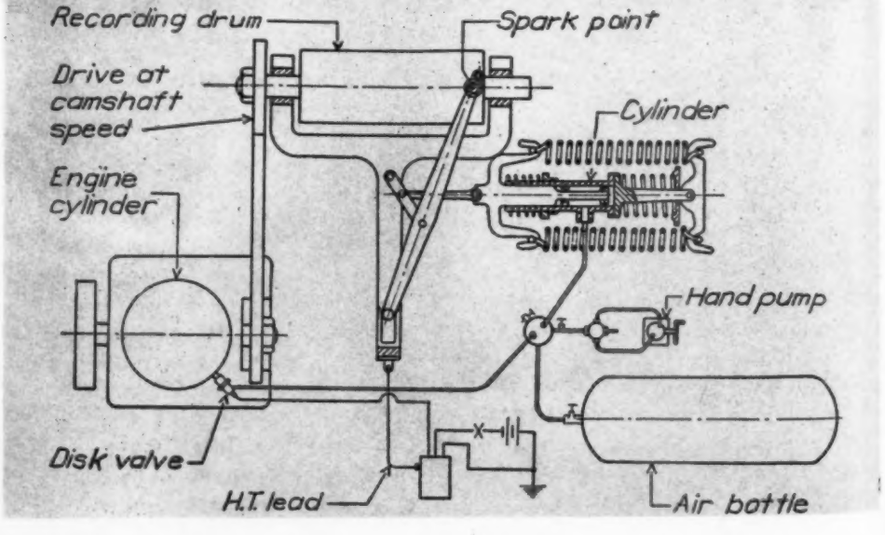


Fig. 4



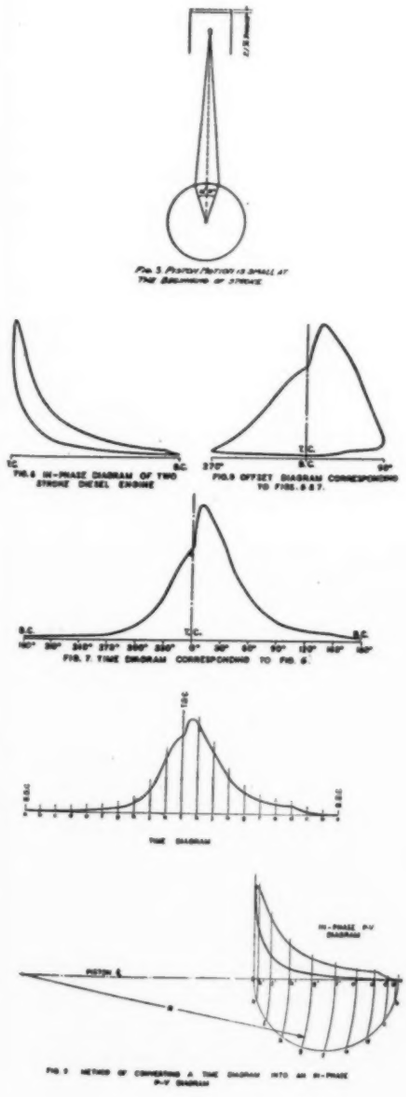
especially true of the time-cards which are the usual products of the modern cathode ray and other electrical indicators. Engineers who are familiar with the ordinary pressure-volume diagrams frequently stand puzzled in front of a time-diagram.

Time and Offset Diagrams

The difficulty with the conventional in-phase pressure-stroke diagram is that it reveals mighty little about the most important phase of the cycle, which is the combustion. The reason for this is that near top dead center where combustion takes place, the piston moves very slowly.

It can be seen from Fig. 5 that while the crank moves 15 degrees, the piston moves only 2.1 per cent from the dead center position. Considering the period from 15 degrees before to 15 degrees after top dead center in the steam engine, steam begins to enter during this period but no rapid changes occur. In a Diesel engine, however, in the same period the fuel is injected, ignited, the pressure rises to a peak and expansion begins. The limited width of the corresponding part of the indicator diagram precludes a close study of these events. The pencil of the indicator moves rapidly up and down while the drum is at a practical standstill; therefore, the events are crowded at the ends of the indicator diagrams. If 5-deg. crank arc corresponds to ½ in. in the middle of the diagram it will correspond to about 0.006 in. at the ends. Consequently pressure changes of considerable difference near the top dead center look alike.

Figs. 5-9



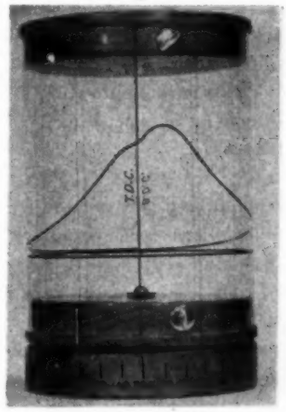
This is a serious fault of the conventional indicator card, which handicaps its use for diagnosing engine defects. To show the pressure changes in truer proportion the "time card" has come into use in which the pressures are plotted on a time or crank-angle basis instead of piston-travel basis. Modern indicators mostly deliver time diagrams, as the drum or sweep moves at a uniform speed rather than following the reciprocating piston. Fig. 6 shows the conventional (in-phase) pressure-stroke card of a two-stroke cycle Diesel engine. Fig. 7 shows the same diagram as a *time card*. Instead of the piston travel the crank rotation serves as horizontal axis for the pressure ordinates. The relation between crank angle and piston travel is visible in Fig. 9, which shows the graphical method how for converting an in-phase card into a time card or vice versa.

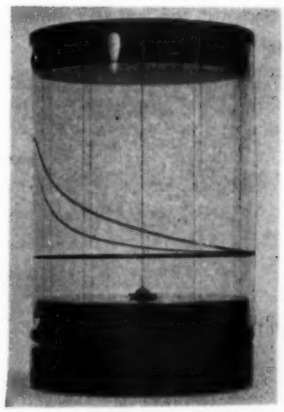
It will be noticed in Fig. 7 that the combustion line has stretched considerably and the line near top center is less steep. The point of ignition can easily be located. Fig. 8 represents an offset card corresponding to the in-phase card of Fig. 6. In an offset card the points on the horizontal axis are 90 crank degrees ahead (or behind) the true piston position. Top and bottom centers are in the center of the diagram, the right extreme represents 90° after top center while the left extreme 90° before or 270° after top center. The appearance of the pressure line near top center is similar to that of the time card.

If a conventional indicator is used to get an offset diagram, all one needs to do is to take the indicator motion from a crank displaced 90° from the crank belonging to the cylinder to be indicated. The indicator then delivers a diagram similar to Fig. 8.

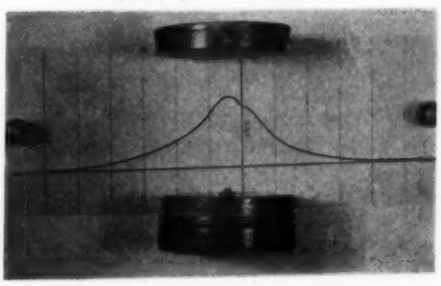
The relation between the in-phase, the offset and the time card can well be visualized by the use of a celluloid model Fig. 10. On a sheet of celluloid a time diagram of a Diesel engine was drawn and a cylinder was formed of the sheet. Looking at the cylinder in the line through the dead centers one sees a picture corresponding to the offset diagram. Looking at right angles to that, one sees the ordinary in-phase diagram. Stretching out the sheet flat, the time diagram is obtained. This representation also shows that the offset diagram does not differ much from the time diagram near top center. Looking from the front, the bending of the celluloid sheet left that portion practically unaffected.

Fig. 10





(Top) Offset diagram
(Middle) In-phase diagram
(Lower) Time diagram



In order to be able to "read" time diagrams, one has to see many of them and become familiar with their peculiarities. The study may begin with the theoretical cycles.

Engine Cycles

Engineers are fairly familiar with the theoretical constant volume (Otto), constant pressure and mixed cycles and their representations by pressure-volume diagrams, but less so with their time diagrams.

Fig. 11 shows the constant volume cycle by both the pressure-stroke and the time or crank angle diagram.

The pressure-stroke diagram consists of two adiabatics *AB* and *CD*. The corresponding lines on the time diagram are obtained by the construction shown on the figure. The construction shown (and also Fig. 10) is exactly true only for infinite connecting rod. For finite connecting rods, the time diagram will be slightly different.

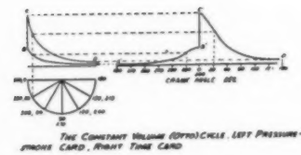
Fig. 12 shows the constant pressure cycle (frequently called Diesel cycle) by both the pressure stroke and the time diagram. The pressure stroke card consists of two adiabatics, *a-b* and *c-d*, one constant volume line *d-a* and one constant pressure line *b-c*. The corresponding lines on the time diagram are obtained as explained.

Fig. 13 shows the mixed cycle, so called because it represents partly constant volume and partly constant pressure burning. The mixed cycle approximates most closely the actual Diesel cycle and the effects of some factors on the engine behavior can be learned from it. For instance, by reducing the load or heat units added, one gets successively cards as shown on Fig. 13. It will be noted that the maximum pressure does not vary when the load is reduced from full to, say, half. At a certain load the mixed cycle changes into a constant volume cycle and if the load is reduced still further the maximum pressure diminishes. The maximum pressure, therefore, is by itself not an index of the load condition in a mixed cycle.

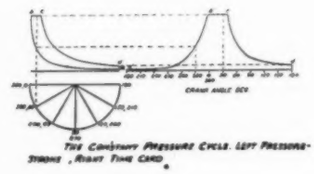
The Actual Diagram

While the mixed cycle approximates most closely the actual Diesel cycle, it is still very far from it. In Fig. 14 a typical Diesel indicator diagram is shown superimposed on a mixed cycle diagram which most closely would correspond to it.

The most significant difference between the mixed cycle and actual diagram is between the



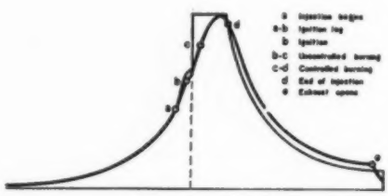
THE CONSTANT VOLUME (OTTO) CYCLE. LEFT PRESSURE-STROKE CARD, RIGHT TIME CARD



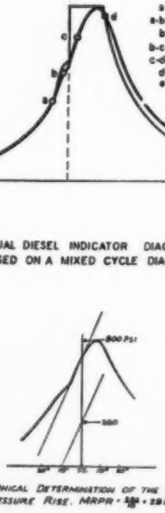
THE CONSTANT PRESSURE CYCLE. LEFT PRESSURE-STROKE, RIGHT TIME CARD

THE MIXED CYCLE, PRESSURE STROKE & TIME CARD

(ABOVE) FIGS. 11, 12, 13 show various engine cycles.



ACTUAL DIESEL INDICATOR DIAGRAM SUPERIMPOSED ON A MIXED CYCLE DIAGRAM



GRAPHICAL DETERMINATION OF THE MAXIMUM RATE OF PRESSURE RISE. MRPR = 800 - 380 PSI

FIGS. 14 and 15.

points *b* and *d*, following ignition where injection takes place. In the theoretical mixed cycle, part of the heat is introduced instantaneously at top center and part of it after top center in such a manner that the pressure remains constant. So at top center there is an infinite rate of pressure rise and after top center zero pressure rise. While this type of cycle would give a high thermodynamic efficiency, in practice such cycle is neither possible nor desirable. It is not possible because it would be necessary to burn a certain amount of fuel in zero time, that means at an infinite rate to get a vertical rise of pressure at top center. That would not be desirable either because no engine structure could stand the shock of the dynamic loading at that point.

In the actual Diesel cycle, injection begins at point *a* and the fuel undergoes a preparation to combustion between *a* and *b*. This is called the ignition lag period. A certain portion of the fuel is injected during this period. At *b* spontaneous ignition occurs which causes the accumulated fuel to burn in violent manner. Yet the combustion is far from instantaneous. In fact the slope of the pressure line *b-c* is a most important characteristic of the combustion. In order to avoid combustion knock, the maximum rate of pressure rise must not exceed a certain value. Not all engines display the same knocking behavior but generally an engine is smooth if the maximum rate of pressure rise (mrpr.) is less than 30 psi. per deg. It is liable to knock if the mrpr. is over 50 psi. per deg., and is almost certain to knock if the mrpr. exceeds 100 psi. per deg. Fig. 15 shows a practical way to determine mrpr. from the crank-angle diagram.

Period *b-c* is frequently called the period of uncontrolled burning. That is followed by a period of controlled burning *c-d* where the rate of burning is controlled by the rate of injection. That part of the Diesel cycle is ordinarily quiet, in spite of the high pressure present, because of the absence of high rates of pressure rise.

After injection ends at *d*, the actual expansion line does not fall as rapidly as the adiabatic of the mixed cycle. The reason is "after-burning." Some of the fuel continues combustion after injection is over because of imperfect atomization, distribution, etc. A certain amount of after-burning is unavoidable. Only if after-burning is still in progress when the exhaust valve or ports open at *e*, after-burning becomes really objectionable. Then the exhaust becomes smoky, and sooting in the engine interferes with good operation. On the indicator diagram such condition is shown by the high toe of the expansion line and it also reveals itself by high exhaust temperatures. Overloading the engine always brings forth this condition but it can also be caused by incomplete combustion due to defective nozzles, low combustion temperature, etc. In the actual Diesel diagram, therefore, a number of items require attention, that are absent in the mixed cycle diagrams. The length of the ignition lag *a-b*, the point of ignition *b*, the rate of pressure rise at *b-c*, and the slope of the expansion line between *d* and *e*. Much can be learned about the engine just by watching these items.

Part II will appear in the next issue.

CONVERSION TO DIESEL SPEEDS MOUNTAIN ROADBUILDING

Lowdermilk Brothers' newly converted dumpster. Its new Diesel adds 40 hp. over the former gasoline engine's rating.

By WILL H. FULLERTON

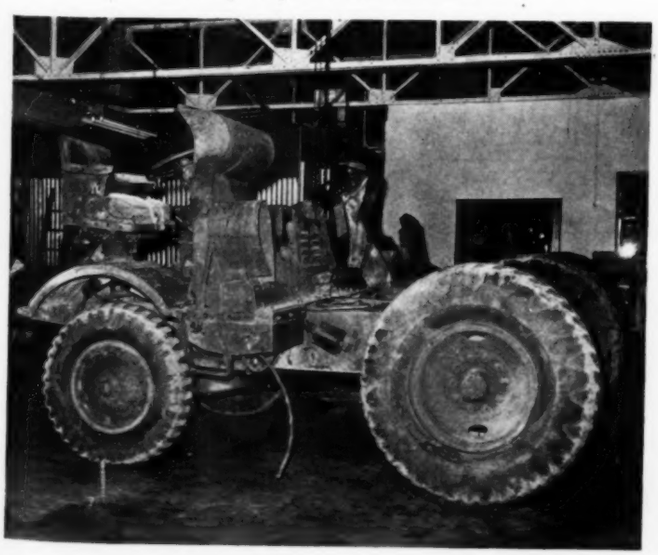
FROM the Rocky mountains comes the latest story of Diesel progress. The Lowdermilk Brothers of Denver, who own a construction company, have had many road building jobs in the mountainous country of Colorado where high altitude and heavy earth and rock moving operations made great demands on their motive equipment. For earth moving operations they used Koehring gravity-type dumpsters, six of which were driven by General Motors Diesels and the remaining four were gas powered. It was noted that the gasoline driven jobs were having a difficult time of it and were not holding the pace set by the Diesels in the mountainous country.

Intrigued by the thought of a possible conversion from gas to Diesel, Mr. Lowdermilk put his problem before the engineers of the Cummins office at Denver, who specified that the job could be done if certain basic changes were made in the dumpsters' chassis to allow for a Cummins Diesel installation. The conversion was agreed upon and work began.

The gas engine and clutch were removed and the frame of the dumpster extended 19½ inches and reinforced. The steering mechanism was modified, as was the front engine support. A 4 cylinder 100 hp. Cummins was installed with a 15 in. clutch, a new radiator, and a new shaft, and Westinghouse air brakes in place of the former mechanical vacuum type practically completed the job.

The last unit was recently completed and put in service and there has been nothing but praise for the conversion. The owners like the economy and the added horsepower, and the drivers like the easier riding qualities of the lengthened chassis and most of all the speed and punch of the Diesels. The success of the conversion is testified to by the great number of orders received from other contractors for like conversions of their equipment in the heavy construction line.

Here is a dumpster before conversion. The gas engine and dump body have been removed.



With the frame extended and a 100 hp. Cummins Diesel installed, the dumpster is ready for final reassembly.

Alco's president, R. B. McColl

ALCO-GE 6000 HP DIESEL-ELECTRIC MAKES ITS DEBUT

IT IS ALCO'S 75,000th LOCOMOTIVE

By WILBUR W. YOUNG

SCHENECTADY, September 9: News—big news unfolded here today before an eager group of trade paper and daily press editors—the first, outside the Alco-G.E. family, to see Alco's new 3-unit, 3-engine, 6,000 hp. Diesel-electric locomotive, its 75,000th, bedecked in Santa Fe colors and insignia and soon to be turned over to speed Santa Fe's crack *Super Chief* across the continent. Several more will follow in quick succession—real quick—judging by the streamlined assembly line production system Alco has worked out in its huge Schenectady shops.

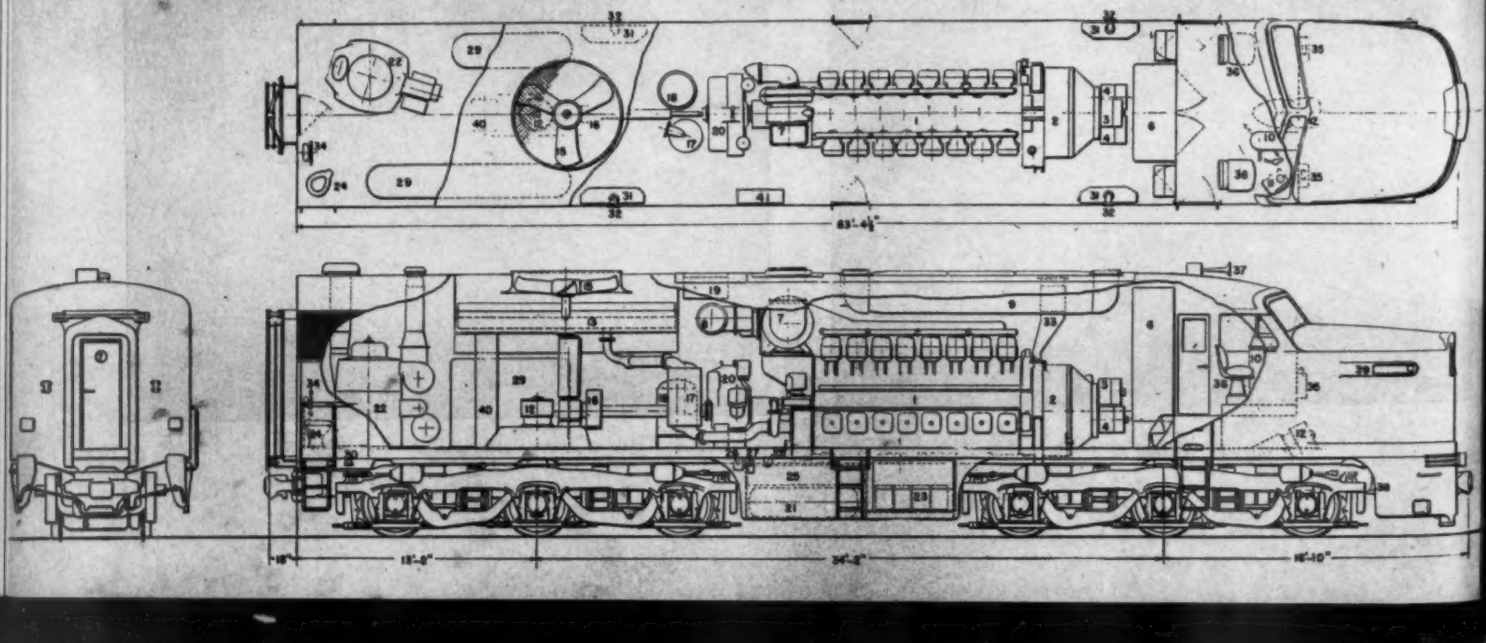
We saw much more today than just another big and powerful Diesel-electric locomotive. We saw history made in the form of a new—entirely new Diesel engine, specially created by Alco engineers for railroad service against a background of 33 years Diesel engine design experiences and well over a century of locomotive building. Picture 6000 hp. net available output at the wheels, from three mighty compact, comparatively low volumetric Diesels and you have a rough measure of this remarkable engine. Sixteen 9 in. by 10½ in. cylinders in V arrangement, operating on the 4-stroke cycle, turn out 2000 hp.—and better, per engine with the help of G.E.'s special turbo-supercharger which is an end product of that company's concentrated experience in aircraft supercharger design. The system is called "constant pressure turbo-supercharging."

This turbosupercharger accounts for approximately 40% of the Diesel's total output. It delivers air to the cylinders at 20 psi. and in quantity double that possible under normal aspiration. Normal operating speed of the engine is 1000 rpm. and when we consider that at this speed the normally aspirated engine is rated 1100 hp., we see that the 2000 hp., supercharged output represents an increase of 80 plus percent over nonsupercharged rating.

Alco places much emphasis on the high availability, ease of inspection and servicing, interchangeability of parts, 98% falling in this category, and low fuel consumption characteristics of the new railroad Diesel.

To dissipate the terrific quantity of heat generated in this exceptionally high output engine Alco has designed an all-aluminum piston that is jacketed in the upper heat zones and internally labyrinthed for delivery of cooling oil in large volume to all heated surfaces of the piston. A beautiful piece of design and manufacture. The entire engine weighs in the order of 18 pounds per horsepower and is produced from beginning to end on an already operating assembly line at Schenectady. No jockeying of parts from here to there and back again—every operation is completed on a straight line basis—and on the part goes to join its mates until a complete, ready-to-run engine rolls off the end of the line. Alco expects to get three a day within a year.

The electrical equipment—generators, traction motors, controls—down to a new type electric



governor, is of General Electric design and manufacture. All mechanical details, including engines, cabs, chassis and trucks, are Alco.

All put together, the locomotive is comprised of two "A" units at either end with a "B" unit between, thus providing cabs a both ends with complete sets of controls. Each "A" unit is 65 ft. 8 in. long, 14 ft. 11 in. high with a wheel-base of 49 ft. 8 in. It weighs 304,500 pounds with 50,750 pounds on each driving axle and its tractive effort (starting) is 61,000 pounds. There are two 6-wheel trucks with 40 in. wheels. It carries 1,200 gallons of fuel oil, 250 gallons of lube and is geared for 120 mph. in passenger service. The braking system includes the widely accepted electric decelerating provision wherein the traction motors are generatored and develop braking effort equal to their tractive output, the resulting current being dissipated in resistance grids.

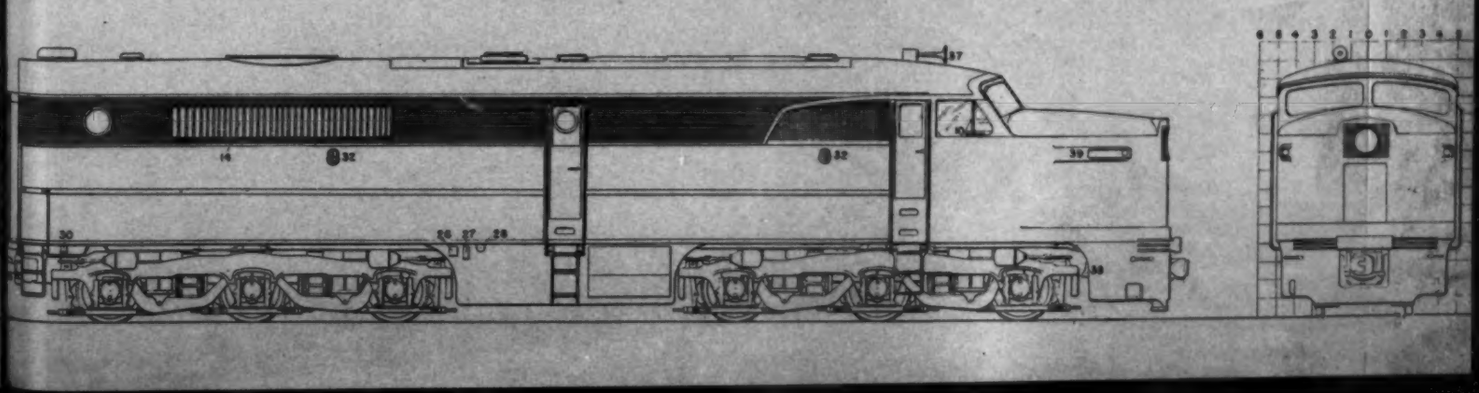
The overall appearance of the locomotive is that of streamlined functional beauty. Much attention has been given to proper balance between the practical requirements of railroading, the standardization of parts for mass production and a generally pleasing appearance. It should be a steam engineman's idea of paradise. His cab is roomy, he sits comfortably in a desk-type chair with his controls within easy reach, his air is filtered and temperature-controlled and his wide, clear-vision windshield eliminates the necessity of poking his head out of the cab –and who wants to at 120 miles per hour?

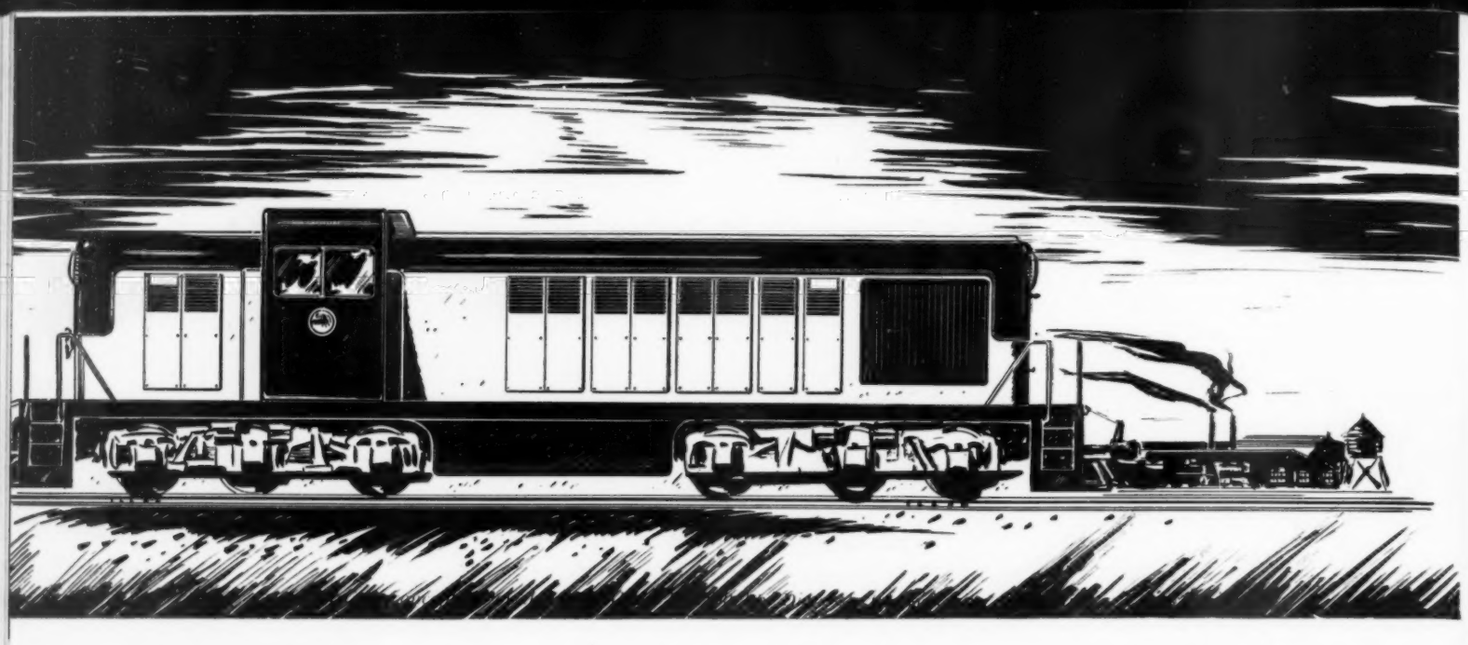
Alco will also build, rather is building a 4500 hp. road freight locomotive made up of three units employing its V-12 Diesel of the same basic design as the V-16, but rated at 1500 hp. each. This V-12 engine will also be used to power a single-engined combination road-

The new Alco-G.E. Diesel-electric locomotive is seen here on road test in Eastern Pennsylvania. This is an "A" and "B" unit of 4000 hp.

AMERICAN LOCOMOTIVE COMPANY'S
75,000TH LOCOMOTIVE

1-ENGINE
2-MAIN GENERATOR
3-EXCITER
4-AUXILIARY GENERATORS
5-TRACTION MOTORS
6-CONTACTOR DEPARTMENT
7-TURBOSUPERCHARGER
8-TURBOSUPERCHARGER FILTERS & SILENCERS
9-DYNAMIC BRAKE GRIDS & BLOWERS (MODIFICATION)
10-CONTROL STAND
11-BRAKE VALVES
12-TRACTION MOTOR BLOWERS
13-RADIATORS
14-RADIATOR SHUTTERS
15-RADIATOR FAN
16-RADIATOR FAN CLUTCH
17-LUBRICATING OIL COOLER
18-LUBRICATING OIL FILTERS
19-ENGINE WATER TANK
20-AIR COMPRESSOR
21-MAIN AIR RESERVOIRS
22-STEAM GENERATOR
23-BATTERIES
24-TOILET
25-FUEL TANK
26-FUEL TANK FILLING CONNECTION
27-FUEL TANK GAUGE
28-EMERGENCY FUEL CUT OFF
29-WATER TANKS
30-WATER TANK FILLING CONN'S.
31-SAND BOXES
32-SAND BOX FILLING HOLES
33-GENERATOR AIR DUCT
34-HAND BRAKE
35-CAB HEATERS
36-SEAT
37-HORN
38-BELL
39-NUMBER BOX
40-TOOL BOX
41-ENGINE CONTROL PANEL





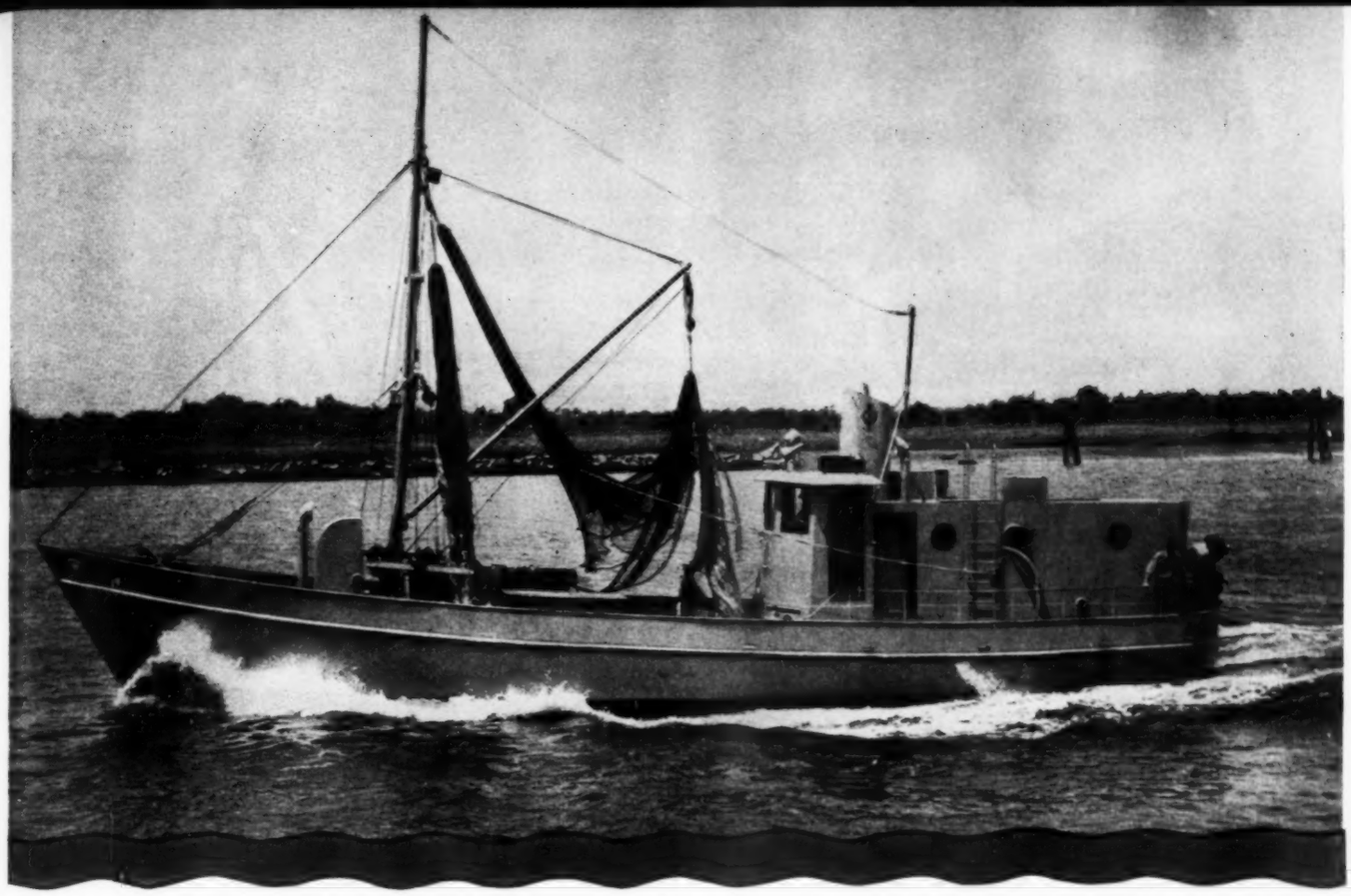
Front end of the Gulf, Mobile & Ohio R.R. 4500 hp. freighter, 25 of which Alco has supplied.

switcher, the first of which will go to Chicago, Milwaukee, St. Paul and Pacific Railroad. Incidentally, there are 25 of the 4500 hp. road freighters now in service on the Gulf, Mobile & Ohio Railroad.

Here is Alco's summation of the new locomotive as expressed by Robert B. McColl, President: ". . . This locomotive marks the turning point in production of rail motive power. The 6000 hp. locomotive will deliver more passenger miles, more ton-miles at higher speeds and lower cost than any other heavy duty locomotive now on the rails. The heart of the locomotive the Diesel engine, was developed solely for railroad use. It is designed to operate a million miles, approximately three years of service without a major overhaul. The fact that a single Diesel engine develops 2000 hp. means that up to three fewer engines and main generators are required per locomotive than in most existing models. We are proud that this locomotive measures up to the exacting standards of speed, power, light weight and economy set up for it when it still was a drawing."

Well the job we saw here today appears every inch a locomotive—450 tons of her, 194 ft. 10 in. long—with three business-like looking Diesels for prime movers . We saw them from start to finish and I mean beautiful finish from the first operation to the test cell.

The Alco-G.E., three-unit, 6000 hp. Diesel-electric locomotive rolling out of the Alco Schenectady shops for test run.



ALL STEEL DIESEL DRAGGER

BELIEVING that the general arrangement, efficiency, safety and comfort of shrimp boats could be vastly improved, the Brunswick Marine Construction Company of Brunswick, Georgia, drew upon vast wartime experience in designing and building the *San Simeon*, a new all-steel dragger. The result, an extremely seaworthy boat of relatively large cargo capacity, was purchased before completion and is now in service for Offshore Fisheries, Inc.

The *San Simeon*, 64 ft. overall by 18 ft. beam, 6½ ft. draft, is framed of 3½ x 2¼ x ¼ in. angle iron and plated with 10.2 lb. plating. Patents are pending on the construction methods used by the Brunswick Marine Construction Corp.; design was by Egbert Moxham, Jr. The hull is divided into four watertight compartments: Forecastle, with pipe berths for four men; 1400 cu. ft. cargo hold; engine room and after-peak. The 5.1 lb. steel deck house includes pilot house, toilet and shower, engine room trunk and companionway, galley and messroom and two double staterooms. These are insulated with 3 in. rockwool insulation and ceiled with ⅜ in. waterproof plywood. The cargo hold is insulated with 6 in. rockwool and ceiled with 5.1 lb. steel protected with special corrosion resistant paint.

Comfort of the crew is given special consideration on the *San Simeon*. An electrically driven water system furnishes fresh running water for shower and lavatory. Windows and 16 in. portholes are arranged for maximum ventilation. The four bunk forecastle is insulated with fibre-glass and well ventilated. Galley and messroom are equipped with ice box, folding mess table, Willis 4-burner Blue Flame stove, sink and cabinets.

A 6 cylinder, 165 hp. General Motors Diesel engine drives the *San Simeon* (light except for 2,000 gallons of fuel oil and 600 gallons of water) at 10 knots with a 44 x 38 three-bladed wheel, 4.4:1 reduction gear, 1900 engine rpm., 430 propellor rpm. The engine, through a front power take-off, also powers an overhead shaft to the drum trawl winch and drives a 1.5 kw. 32-volt generator for lighting, pumps, etc. Fuel tanks are arranged forward, amidships and aft and an electric fuel-transfer pump is provided to trim the vessel to various loading conditions.

An important feature of the *San Simeon* design is that it allows for a 3½ in. Tobin bronze propellor shaft of less than eight feet in length. This effectively reduces wear on shaft bearings, gears and clutch which often arises from misalignment of long shafts due to "give" in the hull.

Early experience with the *San Simeon* has demonstrated that the forward location of the trawl winch, steel booms and fish bins is practical in a shrimper. Nine fish pens are provided and the cargo hold is built with a gurrey trough draining to a waterproof sump.

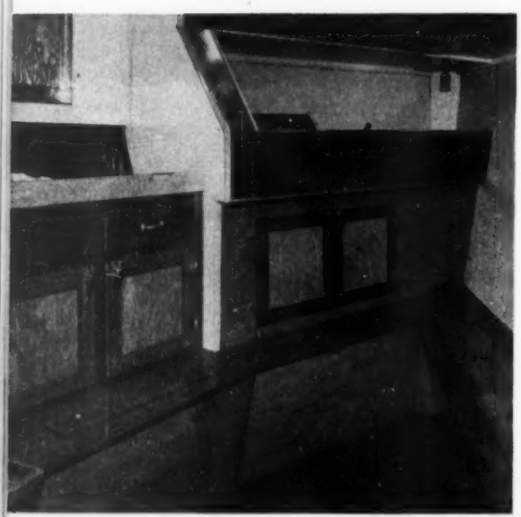
One 75 lb. and one 200 lb. Danforth type anchor and a 6 in. lighted liquid compass are included in the equipment. All paint is to Navy specifications; anti-fouling paint Navy type 105 cold plastic protects the hull. Offshore Fisheries, Inc. bought the *San Simeon* while it was still under construction and have placed order for three others exactly like it.

The "Haven," one of the new 45 ft. Diesel trollers, is powered by a 65 hp. Caterpillar Diesel Marine engine.

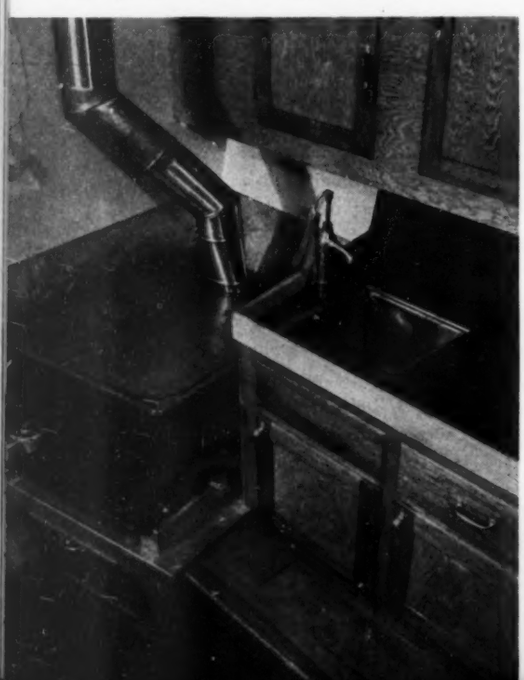
The troller "Cape Ommany' 'is equipped with a 110 hp. Cummins Diesel. She is owned by John Mjorud.

PACIFIC TROLLING

By CHARLES F. A. MANN



Two views of the galley of one of these miniature ships. Top picture shows one of three bunks in tiny crew's quarters in fore section of galley.



THE biggest and most prolific and perhaps the least-publicized fishing fleet in all the world, is the huge Pacific Coast trolling fleet, the "Mosquito Fleet" of American and Canadian fisheries.

Traditionally a one-man and boy operation, usually operated by a string of owner-relatives and, because of the physical size of these vessels, able to go about their little business of trolling for salmon, or halibut or even tuna with practically no fanfare or bigtime big business ballyhoo, the trolling fleet has gone on year after year piling up almost fabulous total records of catch, performance and progressive fishing technique. Hidden like the proverbial invisible mosquito—potent but hard to detect until the ouch stage—trolling vessels have been turned out in tiny and usually obscure boatyards, with most of the finish work and equipment handled by the owner according to his tastes and the size of his bankroll. Usually a troller has a tougher time financing at the bank than the seiner or tuna clipper people. Banks traditionally regard trollers as something of nautical nuisances, like misfit yachts or sailboats, when it comes right down to collateral.

So, the trolling fleet grew up like Topsy, well hidden behind the long shadows of the seiners and clippers. Usually any kind of a gasoline engine that would spin fairly dependably, was the power. Diesel, in its earlier stages, frightened the simple-hearted troller skipper, because very little repair work could be done on it with a pair of pliers, a screwdriver and a trusty pocket knife. And they were too bulky and noisy and costly to fit into the troller economy.

Prior to the recent war, the new high speed, light weight Diesels were getting inside a few hulls of trollers whose owners had that much money—$45 to $80 per horsepower installed.

During the war, parts and repair problems and high prices for fish, brought back a lot of old wreck gas engines—in the Cost-Be Hanged War era. . . . Comes it VJ Day late in 1945, however, and suddenly, 6 to 8 thousand troller operators began thinking of Diesel economy, speed and dependability again.

So, it was natural for some enterprising boat builder to abandon the war time big profit ideas and get on with the idea of lifting troller construction from its semi-mangy status of a hit and miss prima donna business, to a production line, standard Model De Luxe proposition that could fit into the solid niche this type of fisheries has in the postwar era.

The result has been a string of one even dozen almost identical husky wooden-hulled Diesel trollers, looking exactly like, and finished in the same refined comfort and detail—midget purse seiners. In fact a 1918 model Puget Sound purse senier looked exactly like the 1946 model troller, except for another 10 feet of length

Midget trollers "Betty A," "Teddy J," and "Karen A" come back from a trial trip. All three of these boats are equipped with 65 hp. Caterpillar Diesels which propel them through 3-1 Twin Disc reduction gears.

FLEET CONVERTS TO DIESEL

Rigged for trolling, the "Bertha J" lies at her Tacoma, Washington dock. The "Bertha J" is engined with a Cummins Diesel and makes a speed of 9½ knots.

and a bit larger deckhouse. But the 1946 troller has the seiner's square stern, the raised pilot house, the lineshaft auxiliary feature and the one man control setup, and all the comforts of the larger fishing vessel types. Gone is the tendency to skimp on comfort for the crew, and inside, out of the rain and wind, there's plenty of Philippine mahogany and white enamel and enough built-ins for the most finicky family in a new dream home ashore.

Tacoma Boatbuilding Company, right beside its giant steel UNRAA seiners and reconversion jobs on wartime vessels, is turning out this refined type troller engineered, planned and constructed throughout for Diesel propulsion, and stockpiling supplies, hull parts and fittings and machinery, so the prospective owner can just pick up the phone and order his troller, and specify which kind of Diesel he wants in it. That is all there is to it.

The vessels are all 45 x 13 ft. 1 x 8.4 depth and rate 29 gross tons and 19 net tons, and are completely equipped for a crew of 5. The squared stern design borrowed from the seiner type, permits a small tank and shelter, for tuna fishing if desired. They can be used as a seiner, tuna troller or halibut boat, with equal ease.

Propulsion is standardized on 3 types of high speed, light weight Diesels, all with Twin Disc clutches and reverse gears. Cummins, Gray or Caterpillar Diesels can be installed at the owner's wish. The design and engine bed and tank arrangements permit substitution at will. Speed range is from 8 to 9½ knots, depending on whether a 65 Caterpillar or a 110 hp. Gray or 110 hp. Cummins is fitted.

Some owners have already installed direction finders and 2-way radiophones. All but one of the first 10 of this type have the very hush-hush but nifty metal marine pilot, new and inexpensive "mechanical quartermaster" for small boats, built out in a basement factory at Firecrest, Washington, by the dean of north Pacific fish fleet managers. Anything beyond the basic simplicity of hull and engine the owner can afford, can be tacked on to this husky little type.

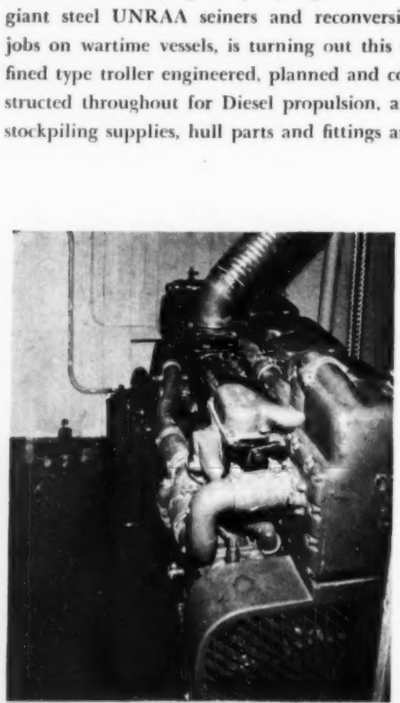
The crew's quarters for 3 in the forecastle open into the compact yet complete little galley, all shiny in enamel, hardwood panelling and stainless steel sinks and oil fired ranges, then the 880 gallon fuel tanks amidships, back of the engine space; then the fish hold that will hold up to 30,000 lbs. and finally the 150 gallon fresh water tank in the stern. The novel rudder assembly is mostly phosphor bronze. A quadrant is fixed on an upward extension of the rudder post, with a 2-1 geared steering wheel, so the troller, in working position, using his trolling box position where a duplicate set of engine controls is fitted, so he can both steer and maneuver the Diesel whilst tending his lines far aft! The tailshaft is machined bronze; so is the rudder stock, and fittings, the shoe and stem and stem band and chain plates . . . all to reduce maintenance and increase longevity of equipment that rusts or wears out. The propellers are all 3-bladed Doran bronze, varying from 36 to 42 inches in diameter, depending on which Diesel engine type is used. The stern bearing is Goodrich Cutless.

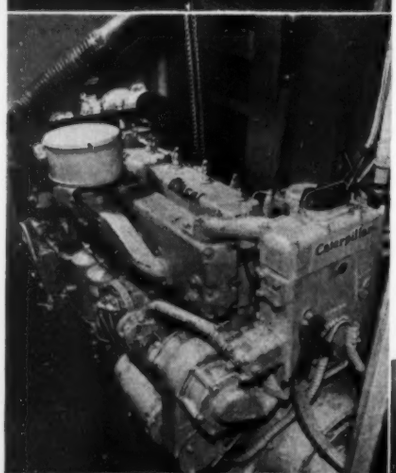
Hours spent in chipping rust off steel or iron fastenings are hours worth from $10 to $50 *each*, at sea, where the fishes roam. And trollers are constructed on the assumption that the owner does the bulk of repair work.

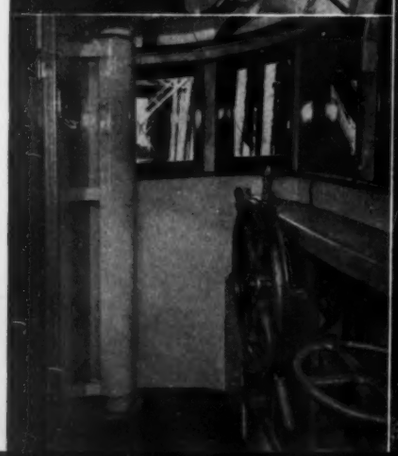
The pilot house and, as stated above, the trolling hatch, each contain full engine controls and buttons for the ships alarm-call bell system to wake up the sleepy crew when a school of fish is sighted.

On the forward deck is a Northern Anchor Winch, driven off the lineshaft from the main Diesel. Aft of the pilot house and practically all in the same space, is a chart table, 2 bunks and toilet. A Northern muffler is fitted in the stack.

A 32 volt electric system, with 16 cell Willard

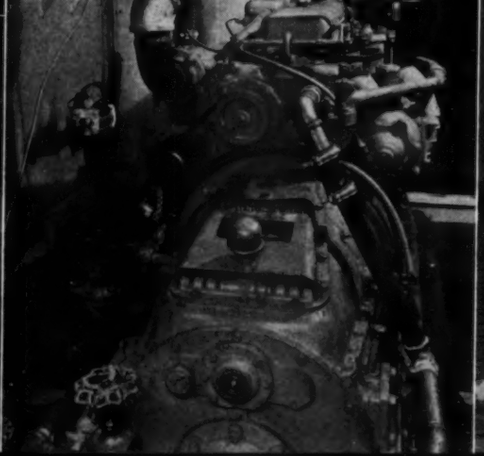






Two typical Diesel installations aboard these trollers are seen at left. Top picture shows a 110 hp. Cummins. Lower picture shows a Caterpillar installation.

Pictures at bottom of page (left to right)—Typical pilot house installation showing Stewart-Warner instrument board (upper left) and the engine controls (lower right); Gray Marine Diesel installation which includes 750 watt auxiliary generator (upper left): The "Spawn," owned by Adolph Olsen, comes back from her trial run with a bone in her teeth.



battery is fitted, powered from the Diesel's own little generator. Since Caterpillar Diesels inherit the nifty but clumsy gasoline engine starting system, no auxiliary power is required except the 32 volt automotive type system. However, in the case of the Cummins and Gray Diesels, electric starters are fitted, so a 750 watt auxiliary gasoline generator set is provided to give it extra starting torque on cold mornings . . . 25 gallons of lube oil are carried.

The Caterpillar and Cummins Diesel drives have a 3 to 1 Twin Disc reduction gear while the Gray Diesels carry a 4.4 to 1 reduction gear, likewise Twin Disc. The Cats and Cummins Diesels turn 1500 rpm. while the Gray will do 2,000 rpm. or better. All have heat exchangers built in and all drive a 1 x 1½ inch fire and bilge pump off the lineshaft drive. All vessels irrespective of which Diesel they carry, have Stewart Warner instrument panel units in the pilot houses.

The following are the first ten, of these trollers to be finished at Tacoma Boat Building Co., with their make of Diesel and name of owner:

Name of Vessel	*Type of Diesel*	*Owner*
Cape Ommaney	110 hp. Cummins	John Mjorud
Carrie	110 hp. Gray	Martin Nelson
Supreme	110 hp. Gray	Ebery Andersen
Betty A.	65 hp. Caterpillar	Clarence Anderson
Teddy J.	65 hp. Caterpillar	Theodor Jacobsen
Karen A.	65 hp. Caterpillar	Stener Anderson
Bertha J.	110 hp. Cummins	Math Johnson
Spawn	110 hp. Cummins	Adolph Olsen
Haven	65 hp. Caterpillar	Fred Owens
Thorvald	110 hp. Gray	Rudy and Einar Lovvold

It is predicted that these tidy little vessels are only the first of many of the same type of Diesel-engined trollers that will dot the fishing grounds off the West Coast from the reaches of Puget Sound to the tip of Lower California. Wherever the sardines run or the tuna or salmon school, canny fishermen will be there to meet them in these little but powerful craft, ready to test their skill.

Troller "Carrie," designed for 29 gross tons like her sister ships, is 45 ft. long with a beam of 13 feet. She has a Gray Diesel.

Like the twins they are, the "Carrie" and the "Thorvald" tie up together. The "Thorvald" is owned by the Lovvold Brothers.

Another of the troller fleet built by the Tacoma Boatbuilding Co. is the "Supreme," owned by Ebery Andersen and powered with a 110 hp. Gray Marine Diesel.

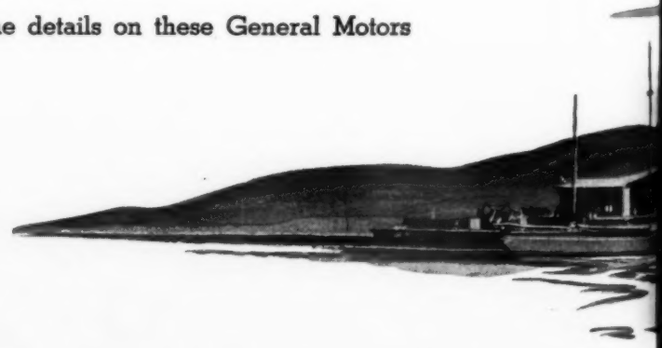
War husky ready to set peacetime records

"Give us an engine with all your General Motors stamina but smaller in size," said Uncle Sam.

So we developed and built the 268A—a power plant in sizes from 250 horsepower to 500 horsepower with the dependability and high efficiency of all General Motors Diesels—that powered more than 5,000 of our vessels of war.

Now the 268A with a shining record of outstanding performance is ready to provide the same kind of service to boat operators everywhere. An outstanding power plant for propulsion or auxiliary service—whatever your power requirements.

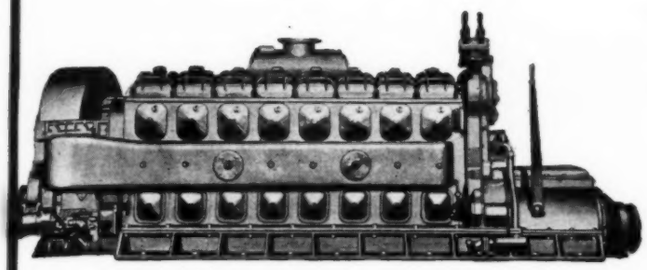
Be sure to get all the details on these General Motors Diesels.



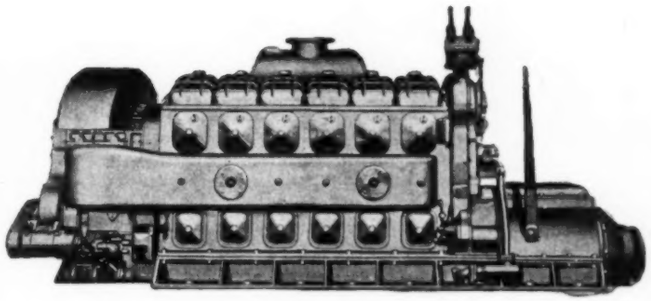
CLEVELAND DIESEL ENGINE DIVISION

CLEVELAND 11, OHIO . . . *ENGINES FROM 150 H.P. TO 2000 H.P.*

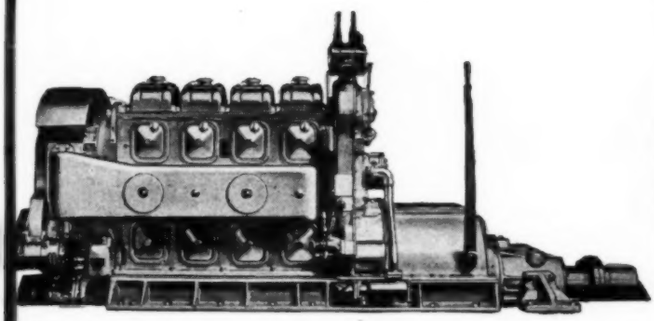
GENERAL MOTORS



Eight cylinders—500 horsepower



Six cylinders—375 horsepower



Four cylinders—250 horsepower

GM

GENERAL MOTORS

DIESEL POWER

WHAT IS A LUBRICANT?*

By HENRY E. MAHNCKE*

ALTHOUGH a lubricant may be readily defined as any substance which will reduce the friction between one object and another object in contact with and in motion with respect to it, the fundamenal problem of determining why a lubricant reduces friction is much more involved. This definition immediately gives rise to a further question, "what is friction?" Friction is the force required to overcome the resistance of the bodies to the initiation or maintenance of relative motion.

The early idea was that friction was entirely due to interlocking surface irregularities, and represented the work required to lift the load from one interlocking position to another. This theory has persisted and even today it is recognized that surface irregularities, or finish, play an important part in any frictional phenomena.

Succeeding theories have tended to give considerable weight to molecular forces existing at the surfaces of bodies in intimate contact, these forces being generally lumped under the term adhesion. However, no theory based solely on these forces has ever been able to explain all the observed experimental facts.

More recently, considerable evidence has been adduced to show that the bulk properties of the contacting bodies also play some part in determining the nature of frictional forces. At least these properties, such as hardness, melting point, elasticity, and crystal structure, can be correlated in some degree with the magnitude of friction.

Any one of the theories offered to date probably represents an over-simplification of the true state of affairs. One of the most important problems in the field is that of effecting a proper balance between the many chemical and physical factors involved.

This paper will be confined to a discussion of liquids, in the hope that in answering the question as to why certain liquids are lubricants, the answers may be applied to other forms of matter.

In a practical discussion of lubricants, it is preferable to restrict the considerations to those intrinsic properties which characterize a lubricant within the limits of the definition. These are viscosity, and something variously designated as oiliness, lubricity and film strength.

Let us examine viscosity first. In a sense, viscosity is really a type of friction itself, since it is a measure of the resistance to an impressed force offered by all liquids, and whose magnitude is expressed in any one of several systems of units such as Saybolt Seconds, Engler or Redwood viscosities, centipoises or centistokes. However, this resistance is quite small compared to the friction of dry surfaces, so that lubrication may be considered to have been effected if the two bodies can be separated by a layer of liquid. Hydrodynamic theory shows that this is possible, and engineering practice has shown that satisfactory bearings can be designed and operated using fluids of almost any viscosity.

A study of liquids in general shows that even 8 centistokes is a fairly high viscosity, so we are led to inquire as to what sorts of liquids possess the requisite viscosities and why. The ASTM charts for indicating the relation between viscosity and temperature are based upon physical research of the last 30 years. Also during this period evidence was brought to light showing that the size and shape molecules also had a definite relation to the viscosity of the fluid.

The accompanying illustration will show this relationship. One notes in the table opposite the very considerable increase in going from octane with 8 carbon atoms to octadecane with 18 and detriacontane with 32. These three are examples of what chemists call paraffins. Hydrocarbons are used for illustrative purposes, but it should be emphasized again, particularly in view of recent developments, that these same considerations apply equally well to other liquids.

Shape as well as size of the molecule effects viscosity. For example, dodecylcyclohexane has the same number of carbon atoms as octadecane, but as the model shows, it has a rather different shape and the process of one molecule

* *Insulation Department, Research Laboratories, Westinghouse Electric Corporation.*

Ed. Note—This article is taken from paper presented at the Spring Meeting of the American Society of Lubrication Engineers, Chicago, Illinois.

YDROCARBON VISCOSITY & STRUCTURE

Hydrocarbon	No. Carbon Atoms	Viscosity at 100°F (cs.)	Viscosity Index
CTANE	8	0.64	———
CTADECANE	18	3.8	———
OTRIACONTANE	32	21	180
DECYLCYCLOHEXANE	18	7	———
TYL OCTADECYL NAPHTHALENE	32	46.	69
YCLOHEXYL CYCLOHEXANE	18	———	———

getting past or around another one is somewhat more difficult. This difficulty is reflected in the increased viscosity.

Up to the present time, viscosity index has served a very useful purpose in educating people to think in terms of viscosity-temperature coefficients and their importance, as related to lubricants. However, it is based on arbitrary standards and must eventually give way to an index related in some way to more fundamental quantities. Some efforts at replacing it are already underway, and these should be actively encouraged.

All of the foregoing considerations apply at constant pressure. However, variations in the external pressure do introduce variations in viscosity which are recognized as being fairly important in lubrication studies.

Thus far it has been shown how knowledge concerning the chemical structure of a compound, its molecular weight, etc., correlates with viscosity characteristics. The practical value of such knowledge lies in the ultimate possibility of being able to use it in tailoring molecules to fit a desired specification.

The second property mentioned as characterizing a lubricant is oiliness. This is probably the most puzzling of the properties required in a lubricant, and for that reason, the most interesting.

For purposes of discussion, we will define it as that property of a lubricant which allows a reduction in friction under conditions such that viscosity plays no part. In other words, a truly liquid layer is absent.

If the true liquid layer is absent and there is still a reduction in friction, it can be assumed that some of the lubricant remains. The important conclusion one notes in reviewing oiliness effects is that most of the available evidence indicates the existence of a very strongly held film of some sort which can resist considerable efforts at dislodging it and thus acts as a shield on the surface of the otherwise contacting parts.

The molecular models give a partial explanation of the nature of the film. The hydrocarbon looks pretty much the same all over, and the attractive forces of the component atoms can be thought of as being fairly well balanced inside this structure. However, if some new kinds of atoms are introduced in the molecule, such as oxygen in the model of stearic acid (seen on this page), this balance of forces is disturbed, which can very likely result in the existence of some excess force at a particularly locality in the molecule. Such molecules are called polar, and means for demonstrating the existence of these forces are quite well developed. These molecules can then combine in one way or another with other atoms or molecules which are likewise possessed of suitably attractive forces. The atoms in some metallic surfaces, fortunately for the lubrication engineer, constitute a large class of such materials in that they do seem to be able to attract a large variety of surface films, whose one common property seems to be that they are composed of polar molecules.

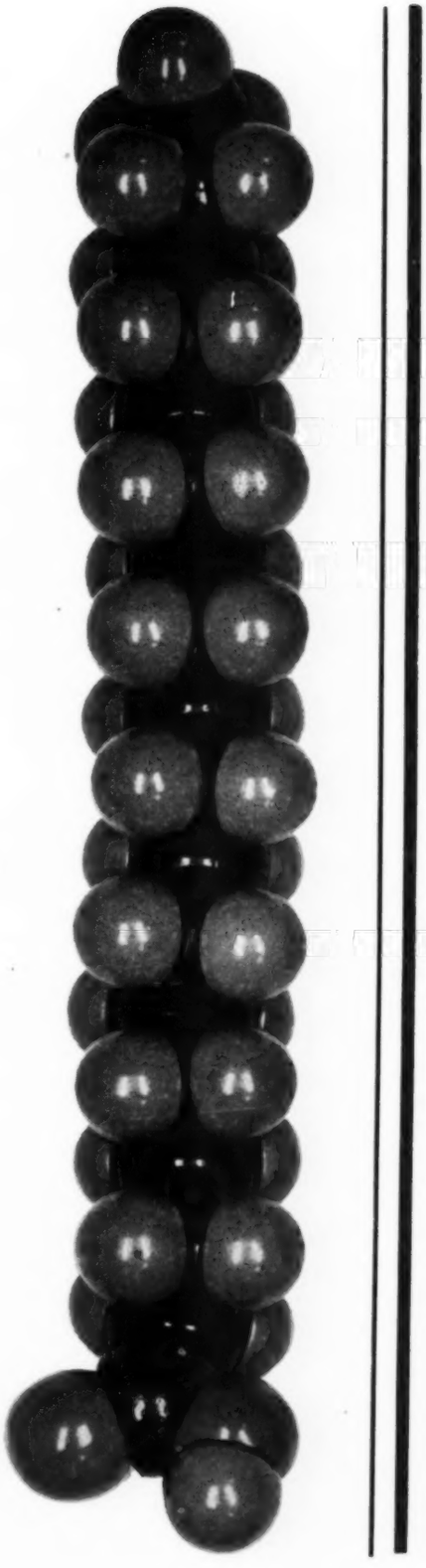
The results of electron diffraction of thin films of stearic acid on metal indicate that at the surface of the metal, all the stearic acid molecules in the first layer or first few are arranged in a certain order with their polar ends directed toward the metal and the long tail pointing away from it, perhaps not quite straight, but at a small angle from the vertical. Stearic acid is used here as an illustration, but presumably other molecules act in the same way.

We have not yet arrived at any very complete and satisfactory explanation of oiliness and associated properties, beyond the fact that we have a definite but still rather poorly understood relation between the proven existence of these films and certain frictional characteristics. It is to be expected that knowledge gained in this field will also serve to explain the observations made in the closely related fields of corrosion protection, wear prevention, E.P. lubrication, wettability, etc.

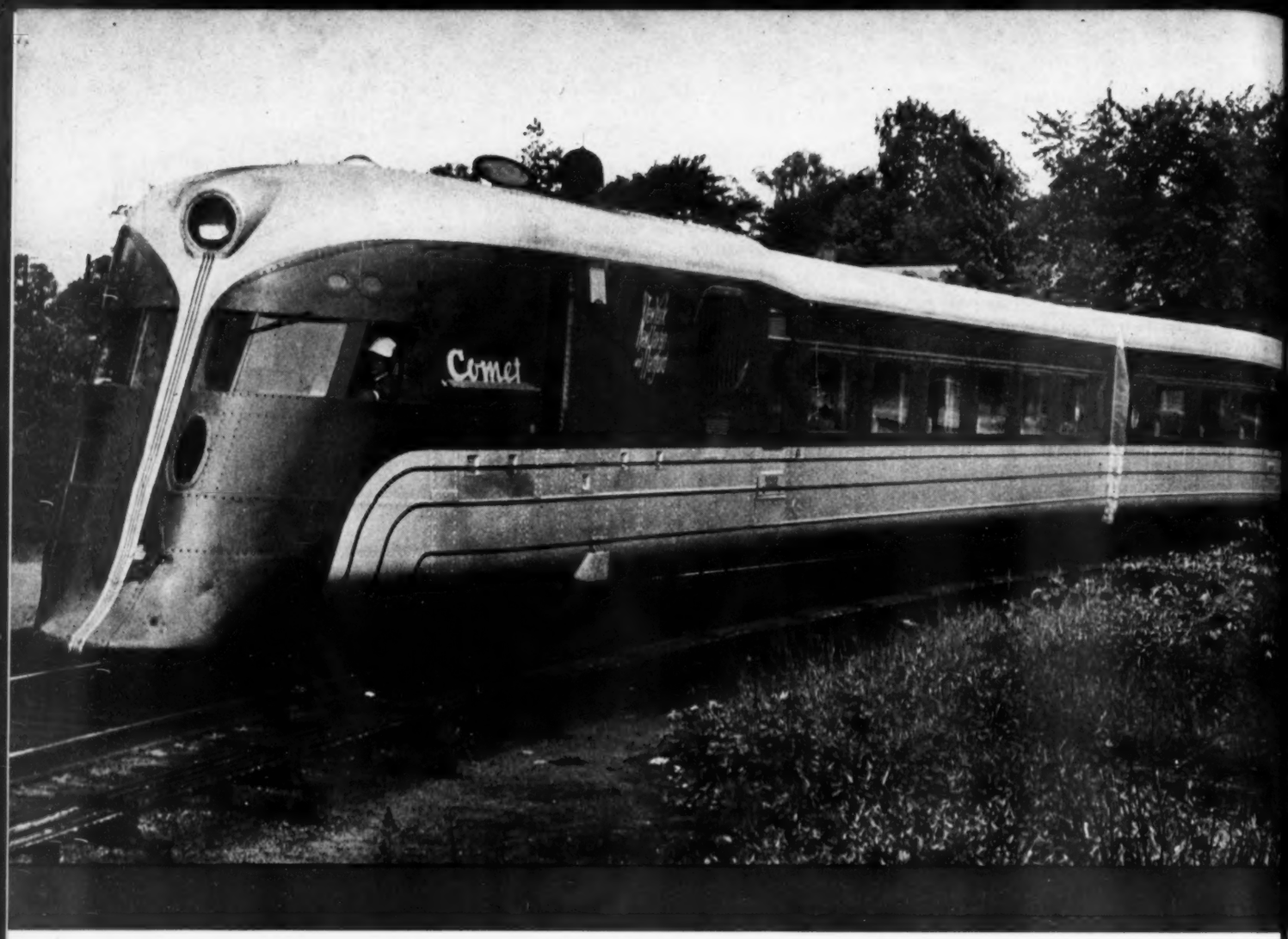
It is also pertinent to indicate certain flaws in the knowledge we already possess. The more possession of polarity is no criterion of oiliness, since available data show no direct relationship between dipole moment and lubricating ability. It does indicate the possibility of film formation.

Beyond this, the existence of a film of the nature described is also no guarantee of lubricity in the ordinary sense of the word. Once the film is laid down other characteristics such as chain length and chemical reactivity are apparently very important, as witness the difference between the frictional properties of a film of water and one of stearic acid.

Briefly, a lubricant is a material which reduces friction through its property of viscosity and its ability to form protective films.



Molecular model of stearic acid, a typical example of a polar molecule which adheres to metals and acts as a shield between bearing surfaces by forming a strongly held film between contacting parts.



NEW HAVEN STREAMLINER *COMET*

By BRUCE C. SISSON

BACK in June, 1935, the *Comet,* the New Haven Railroad's new Diesel electric streamliner entered the Boston-Providence passenger service for which it was obtained. It was a new type articulated train, especially designed for fast short haul intercity travel. Its unique design provided power unis at both ends of its 207 foot length, and permitted operation from either end, with no time wasted in turn-around periods, which were required by the steam locomotives previously used.

On the 44 mile run, making two intermediate stops, the *Comet* averaged a 60 mile an hour clip, with a slight lengthening in the schedule time when additional stops were made. This service continued into the war when traffic exceeded the 160 passenger capacity of the train, and it was necessary to put it into branch line service less suited to its design, but still taking advantage of its double end operating features.

With the cessation of hostilities it was possible to put into effect, delayed plans for rejuvenating the *Comet,* with the installation of new Diesel engines. Afer careful consideration of space and mounting requirements, coupled with a general survey of railroad Diesel-electric installations, the New Haven purchased its first Hamilton Diesels. Following installation of the new Diesel engines and a new steam generator for heating, as well as classified repair work, the *Comet* went back into service on August 15.

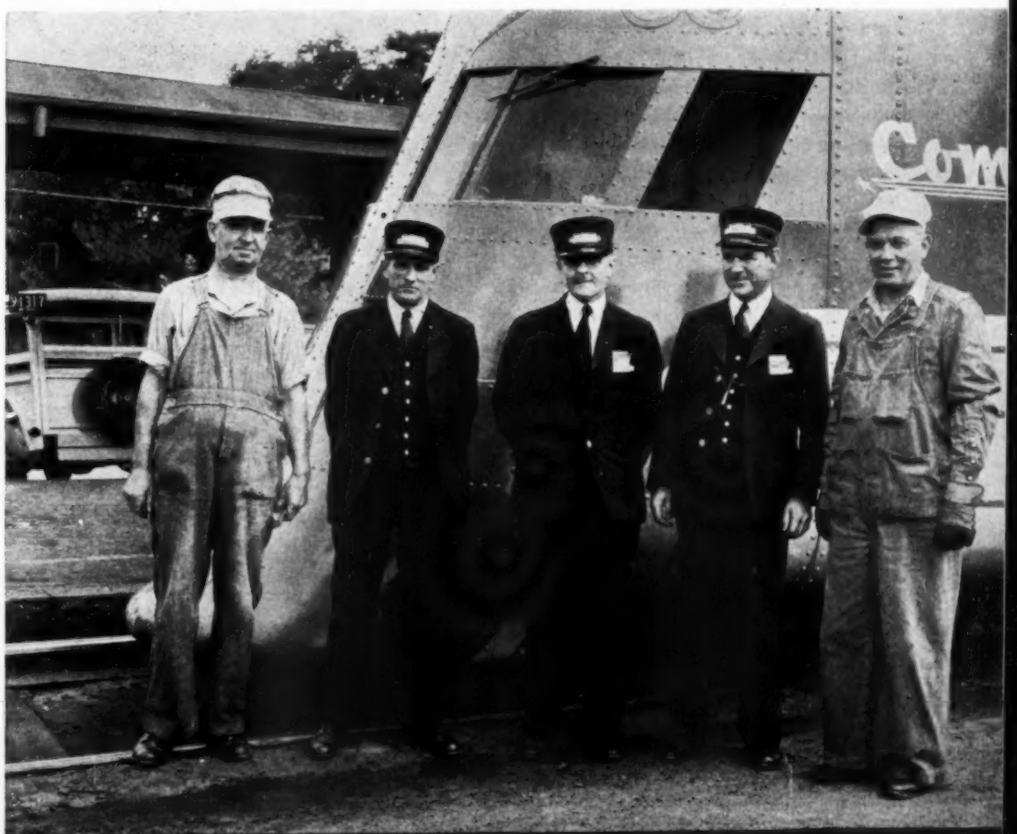
The Diesels are 4 cycle, 6 cylinder models, developing 400 horsepower each at 900 rpm. Each engine drives a main generator supplying power to two traction motors on each of the end trucks. The traction motors are connected in series while accelerating to approximately 30 miles per hour and then re-connected in parallel. Auxiliary power for air conditioning, air compressors, lights, etc., on the train is supplied from the main generators at idling speed, 390 rpm. When notched up, the auxiliary load is taken over by two, 30 kw. auxiliary generators mounted on the main generators.

The train is made up of three articulated cars, with a total length of 207 feet and a total weight slightly over one hundred thirty tons, this lightness being the result of the train's aluminum construction. The center car, together with the articulated ends of the power cars is carried on the two middle trucks, an arrangement which eliminates two trucks.

(Above) View of the newly redecorated passenger compartment in the "Comet's" last section.

(Left) Powered by two 400 hp. Hamilton Diesels, the "Comet" returns to service.

(Below) Train crew of the "Comet" headed by Conductor F. R. McDonald (second from right) pose for picture.



REPOWERED

For the present the *Comet* has returned to service on a shuttle schedule between Braintree, Cohasset and Whitman, Mass., where short turn-arounds are frequent throughout the day.

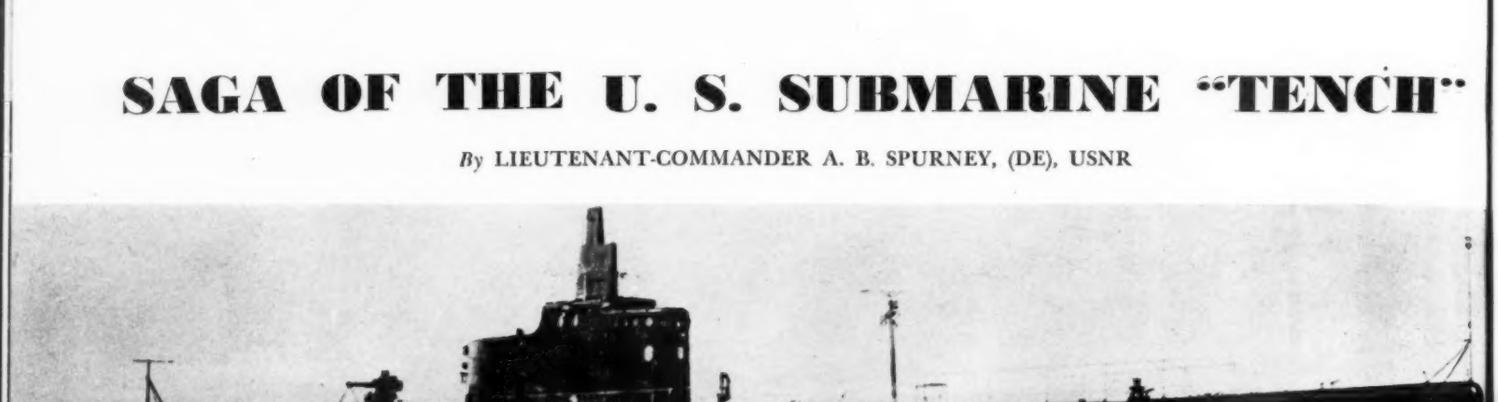
The Diesel engine auxiliaries of the *Comet* include Donaldson air cleaners, Nugent lubricating oil filters, Nugent and Purolator fuel filters and Burgess exhaust snubbers with Unarco insulation blankets.

The *Comet* was originally designed to accelerate to 55 miles per hour from a dead stop in 120 seconds. With only one engine operating the train will do over 60 miles per hour.

The *Comet* has been completely refinished with new interior upholstery and decorations for the comfort and convenience of her passengers.

SAGA OF THE U. S. SUBMARINE "TENCH"

By LIEUTENANT-COMMANDER A. B. SPURNEY, (DE), USNR



Typical United States submarine as described in article. It represents some of the most highly developed engineering skill in the world.

THE *U.S.S. Tench* (SS417) was one of our Navy's vast submarine fleet. Commissioned in October, 1944, it represented the later design in submersible craft, those into which had been incorporated the lessons and experience of over two years of successful submarine warfare against the Japanese. It could dive deeper, submerge longer, cruise farther, fire more torpedoes and shells. Yet, in the year of war which remained, our design and construction continued to progress; our latest submarines culminate a program which most certainly surpassed the underseas craft of the German navy.

Refinements of design during the last year, however, concerned fire control apparatus and electronic gear for the most part. The engineering plant which made its debut in the Tench-class submarine proved so successful that it became substantially standard.

War patrol is the justification of all that goes into a submarine. The *Tench* made three war patrols, all "successfull," meaning that enemy tonnage was each time sunk or damaged, and returned with 80,000 miles under her belt. Not a man was lost. Not a major engineering casualty occurred during the period of hostilities. The *Tench* is now going into "inactive status," whereby the vessel will be preserved intact, but in such a manner that she can be placed in full commission within ten days. Hence, she will continue to be a fighting unit.

The main propulsion installation is Diesel-electric. Two main Diesel engines are located in each of two engine rooms. To each engine is coupled a generator, the output of which is directed by controllers, located in the maneuvering room, either to the battery, the motors, or both. The lower flats of the maneuvering room contains the four main motors. Two motors are mounted on either propeller shaft. By virtue of double-armature juxtaposition and an integral housing, the two units on each shaft become essentially one, and are referred to as the starboard motors, or port motors.

During submerged operations, these motors are supplied their current from the forward and after batteries.

There is no provision for direct drive by the engines, all propulsion being contingent upon the supply of current to the main motors. Consequently the engines are non-reversible; maneuvering is accomplished by reversing the motor poles in the control cubicle of the maneuvering room. The controllers are the hub of propulsion control: once started, the engine rpm. and generator kw. are the complete custody of the controllers.

A fifth Diesel is the auxiliary generator, known as the "dinky." -Housed in the lower flats of the after engine rooms, between #3 and #4 main engines, this engine is designed to relieve the batteries of the auxiliary electrical load, that current expended for lighting, steering, galley range, and other loads besides propulsion. The "dinky," however, is a most versatile installation; it can also be used to furnish lower charging rates to the battery, or, through the battery, slow speed propulsion.

The endurance factor was of tantamount importance to our submarine warfare against the Japanese. It is this which influenced the design of a fleet-type submarine displacing almost the tonnage of our modern destroyers. The predominant German U-boat type nominally displaced 750 tons, not even half the tonnage of our submarine. But their operations were governed by the short distances of the Atlantic and

Mediterranean, by the facility of replenishment from supply-submarines or clandestine depots, and by the plentitude of targets.

On the *Tench's* first patrol, we started from Pearl Harbor, spent thirty days in the Yellow and China Seas, and returned to Guam. Underway continuously for two months, we covered 15,000 nautical miles; en route to the area, we had stopped off at Saipan. Nevertheless, this illustrates that portion of the endurance factor which is requisite fuel capacity.

In a submarine, the storage and the gradual depletion of the supply of fuel oil is necessarily related to the maintenance of a diving trim, equilibrium in neutral buoyancy. Hence, full oil tanks are divided into three main categories: normal fuel, fuel ballast, and variable fuel supply.

The normal fuel tanks are located in spaces between the outer shell and the pressure hull, are open to the sea only through the compensating system, and are always full of fuel, compensating water or both. The fuel ballast tanks are very similar to main ballast tanks, except that the outboard vents may be blanked off, and the flood accesses are equipped with flood valves; converted to fuel tanks they operate as do the normal fuel tanks. The variable fuel tanks are located one extremely forward, the other extremely aft and are designed to store fuel in direct aid to the fore-and-aft trim of the submarine; they are not connected to the compensating system: fuel is customarily blown with air from these to a normal fuel tank.

Fuel oil from whichever storage tank is "on the line" passes into the collecting tank, a settling tank into which no compensating sea water should be allowed, is then run through a centrifugal purifier, one in each engine room, and finally into a clean fuel oil tank, one in each engine room, before going to the engines.

The compensating system allows sea water at sea pressure to displace the volume of fuel expended, preventing the free surface effect of mobile fuel from aggravating the roll of the ship. It also compensates for the loss of weight in fuel expended, and maintains the pressure between inner and outer hulls equal to sea pressure, preventing collapse of the outer shell at deep submergence.

When running the engines, sea water from the engine cooling systems, under pressure from the attached sea water pumps, may also be directed into the compensating system to provide adequate pressure.

The lube oil system is much more simple. Five lube oil storage tanks are located, all within the pressure hull. Transfer is effected by a detached pump directly to the engine and motor sumps. Engine lube oil is continuously purified by a centrifuge, taking suction from and discharging into the sumps.

The engines have closed cooling systems, the fresh water also cooling the lube oil. Sea water from the intercooler is circulated through the exhaust header then diverted to the compensating system or sprayed into the muffler exhaust. The generators are cooled by air which is cooled, in turn, by sea water. Air intake to the generators is accomplished through precipitron units, one to each brace of generators. Cooling air to the main motors is also taken through precipitrons.

The supply of engine air for combustion is of dire importance in the submarine. At no time can the supply of engine air be interrupted; under no circumstances can the engines be started before this supply is established. Otherwise, in a craft which is virtually hermetically sealed, the vital oxygen supply in the compartments would quickly be depleted.

This problem is further complicated by the low freeboard, or projection above the waterline, of a surfaced submarine. The decks are usually awash in any but a still sea; speed, even in calm seas, produces a great quantity of spray. This sea water must be prohibited from entry into the engines and limited in its access to the bilges.

Consequently, a huge air valve is provided topside, within the metal shielding of the conning-tower fairwater, known as the main induction. Air ducts run through the superstructure from the main induction, entering the pressure hull through secondary induction valves at each engine room and the maneuvering room. To minimize the ingress of sea water, the main induction is surrounded by complex baffling, itself a major problem in submarine design. The engine room inductions then open directly into the compartment, so that any water having gained entry is spilled into the bilges. The engine blowers then take suction from the compartment atmosphere.

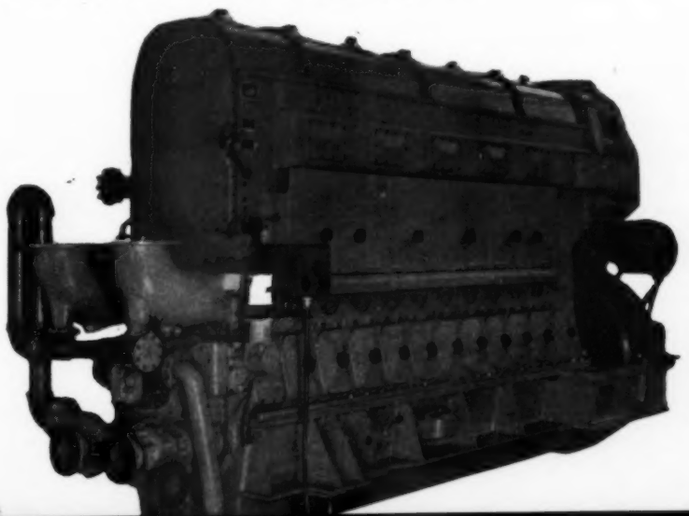
An air lock, consisting of a watertight door followed by a gasketed swinging door, separates the engineering spaces, aft, from all compartments forward. In this manner, draft to the engines is confined to the induction lines and discouraged from suction through the conning tower hatch, amidships. At the same time, exhaustion of compartment oxygen is limited to the four spaces aft of the air lock, should stoppage of the induction air occur.

Hull ventilation air is also taken in through a sector of the main induction and, passing through a blower in the forward engine room, distributed to each compartment. Ventilation exhaust supplemented by noxious and combustible gases gleaned from the batteries, is normally conducted to the forward engine room to be burned in the engines.

Control of all air induction is, thus, vital to the safety of all hands. It is also necessary for their comfort, since the air conditioning unit is in series with the hull ventilation system.

The exhaust from each engine is coursed through a sea-cooled header, an inboard exhaust valve, manually operated, a sea-sprayed muffler, and an outboard exhaust valve operated by the throttleman. Over and above the interests of efficient combustion, all after-burning, ejection of sparks, or smoky exhaust must be pre-

View of Fairbanks-Morse 10-cylinder, opposed piston Diesel. The U. S. submarine "Tench" has four of these powerful prime-movers which develop 1600 hp. at 720 rpm. according to the Navy rating system.



vented to avoid visual detection by the enemy. Every effort is made by the Black Gang to obtain proper timing and loading. But profuse sea spray is nevertheless introduced into the muffler to minimize the smoke, extinguish any incendiary particles, and cool the exhaust.

It is apparent, then, that the operation of the Diesel engines is not an independent maneuver. In a submarine, their operation in inexorably related to the surface trim of the boat, to safety in diving, to function of the general induction of air, to the endurance factor of war patrol, and to the efficiency of submerged propulsion on properly charged batteries.

The engines installed in the fleet-type submarines are either Fairbanks-Morse or General Motors. As a rule, government-built boats have the Fairbanks-Morse, i.e., submarines built at the Navy Yards, Portsmouth, N. H., or Mare Island, California. Contract-built boats usually received General Motors engines, i.e., submarines constructed by the Electric Boat Co., or by Manitowoc Shipbuilding Co. The respective numbers were just about equal.

The *Tench* had four Fairbanks-Morse 10-cylinder, opposed piston, 8⅛ in. x 10 in., main engines with U. S. Navy rating of 1600 hp. at 720 rpm. The rating of the coupled General Electric generators was 1100 kw. at 415 v. and the same revolutions. The batteries were comprised of Gould Kathanode cells. The main motors were General Electric, capable of 1350 hp. per armature, 2700 hp. per shaft, at 280 rpm.; these motors represent a drastic departure from the prior art in that reduction gears, always a leading cause of high noise-level, were avoided. The meagre loss in efficiency was more than regained in excellent silent-running characteristics.

The auxiliary engine is usually of the same manufacture as the main engines. The *Tench's* "dinky" was a Fairbanks-Morse 7-cylinder, opposed piston, 5¼ in. x 7¼ in. engine with U. S. Navy rating of 440 hp. at 1200 rpm. It drove a General Electric generator.

The engine rooms are circular in cross-section, carrying out the cigar-shape of the pressure hull. The engines are mounted on frames of the hull structure and placed longitudinally either side of the center-line. The control ends are located forward with the linkages to both exhaust valves, and the engine air induction valve. The Roots-type blowers are aft, hovering above the generators. Between these and the after bulkhead are the fuel and lube oil purifiers.

A platform deck runs the length of the compartment at the waist of the engine, along the center. A similar platform runs below, in the lower flats, giving access to the lower crankshafts, generators, precipitron, the auxiliary unit, and myriad valves.

In one of the engine rooms, the auxiliary unit so placed between the engines, is the air compressor, actually two four-stage Hardy-Tynes motor-driven compressors capable of 300 psi. Also in the same engine room, but against the forward bulkhead and extending through the waist platform deck, are two Badger (Kleinschmidt type) power evaporators, rated at 1000 gals. of fresh water per day.

The auxiliary unit in one of the after engine rooms is the "dinky" engine, the exhaust valves of which tie into one of the main engine exhaust headers.

Needless to say, there is just enough room for Black Gang personnel to run the plant. An auxiliaryman lining up the compressors for an air charge must be a small man in elevation and plan, as must be any man inspecting sumps or lower crank cases.

The Watch, Quarter, and Section Bill, provides a throttleman for each main engine while underway. After engine room throttlemen also manage the "dinky." These men are always rated motor machinist's mates, although the exigencies of extended patrol occasionally required that a fireman, first class, (MO MM striker) be given a throttle. Their duties are to line up the engines, start them, turn them over to the Woodward governors for control from the maneuvering room, inspect for proper temperatures and pressures, and keep the engine record sheets.

Certain "motor-macs" are delegated to the auxiliary gang. There is one on each section watch. His major duties lie in the engine rooms, operating the stills or compressors. There is always one, usually two, chief motor machinist's mates in charge of the Black Gang, and one chief in charge of the auxiliary gang.

The engineering officer heads the black gang gang and the engineering plant. The auxiliary gang reports to the first lieutenant. It is customary also to include the electrical plant and personnel in the engineering department because of the intimacy of the equipment; the electrical officer is then assistant engineer. Responsibility for maintenance as well as operation resides with these officers.

The quality of performance of engineering personnel in submarines is inordinately high, and necessarily so. Our leading throttlemen had received instruction in Class "A" Navy schools, seen surface fleet duty, been screened for submarine duty, put through submarine school, received special instruction in their particular installation at the building yard, then subjected to the ardors of shakedown.

Our qualified "motor macs," those having earned the coveted submarine "dolphins," were men of the highest value in that they had gained the difficult quality of versatility.

And with this new type of submarine warfare came a type of submersible warcraft, but one whose efficacy as a surface unit was much improved. Maneuverability became more important, as did new and more formidable armament. But of salient importance was surface speed, not merely a high flank speed for short attacks or evasion, but efficiency at sustained standard and full speeds. The surfaced submarine was called upon to stalk convoys for extended periods, intercept ship movements detected in remote lanes; cruise for her own defense at high speed while zigging, maintain adequate headway to abet rapid submergence, so propulsion on the engines became primary.

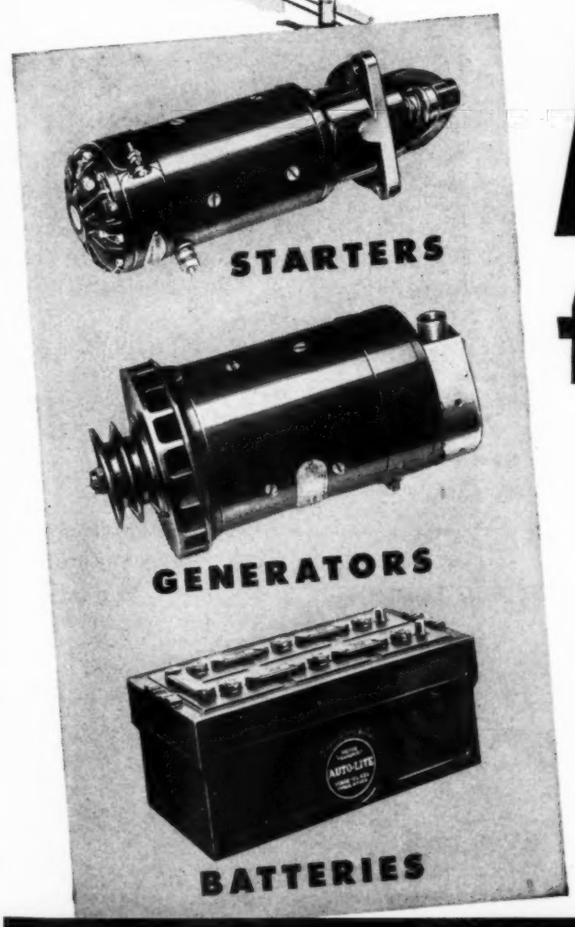
In the *Tench's* early patrols, our schedule of speeds was based upon shaft rpm.; for instance, standard speed required "maneuvering" to make 180 turns. In calm seas, favorable weather, when little rudder was being used, we found that one engine at full load could give us standard speed. On the other hand, under adverse conditions, it was difficult to exceed 200 turns using two engines. The variation of engine combinations to produce precise turns was found to develop inefficient loading.

Hence, after much experience, we began utilizing "gw. load" on the generators as the modulus of our speed schedule. It was learned that 880 gw. per generator was optimum load, considering both Diesel and electrical installations. Correspondingly, an order "all ahead standard" automatically put two engines on the line, with generators loaded to 880 kw. The small fluctuations in turns, hence speed-through-the-water, were of lesser importance than sensible usage of the engines and reduction of our exhaust smoke. When keeping station in formation, or when tracking a target from a chosen vantage

. . . . *And now please turn to page 82* . . . .

On Land or Sea—

Switch to AUTO-LITE for DIESELS



AUTO-LITE engineers were among the first to start internal combustion engines electrically. Thirty-five years of automotive electrical experience go into the development of Auto-Lite electrical systems for Diesels. Auto-Lite systems for Diesels are complete from generator to voltage control to battery to starter. Executives and engineers are invited to consult us on Diesel cranking or generating equipment.

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DIESELS TEAR UP LANDSCAPE FOR NEEDED CROPS

South of Valparaiso, Indiana a Caterpillar clears out a fence row.

This Diesel can knock down trees at a fuel cost of 8 cents an hour.

THE pleas for food, and more food, to combat the ills of a hungry world are being met by the American farmer with an alacrity so definitely American that those food authorities who point to the threat of starvation throughout the war-torn world must vision success in their efforts.

For the humanity of the American people will do more than provide for the needy of other nations; it will maintain the high living standards of our own nation through its ingenuity, its determination to produce fully that America might never suffer the political upheavals which are nurtured in so many hungry people.

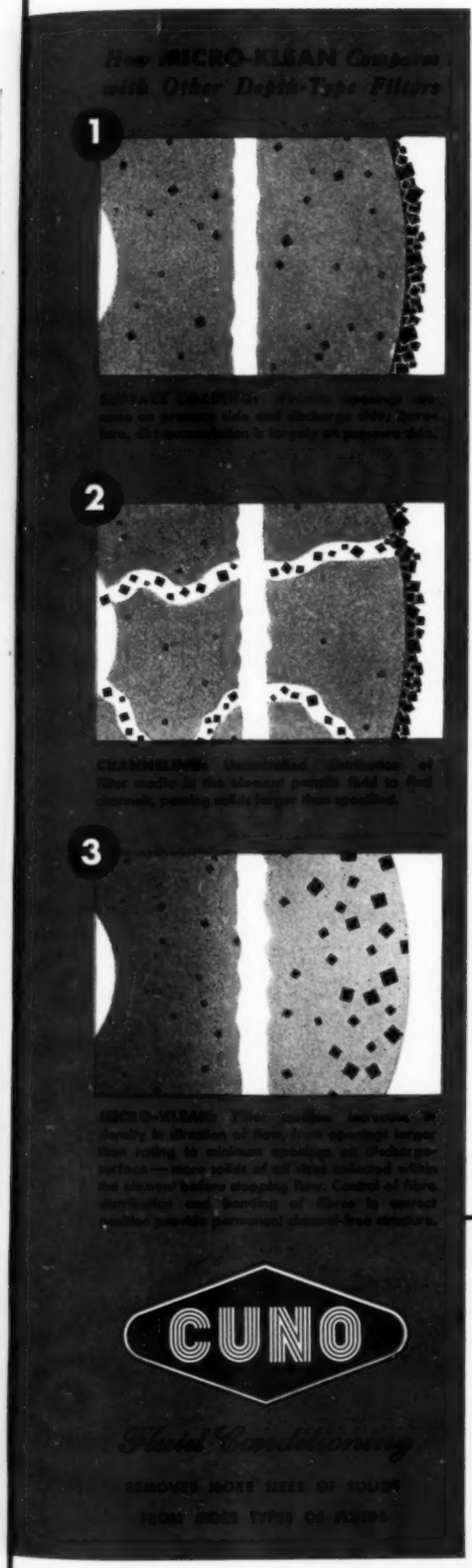
The American farmer is the epitome of such determination and in the present food crisis is utilizing every available foot of his acreage to produce more and still more food.

In the rich farmlands of Indiana, for example, farmers are renovating thier farms, eliminating land-consuming arrangements that still greater yields might be realized. Kenneth Homfield, Valparaiso farmer and contractor, is typical of the Indiana worker. He has utilized his tractor and bulldozer in countless land-clearing operations which tend to give his neighbors additional ground on which to produce.

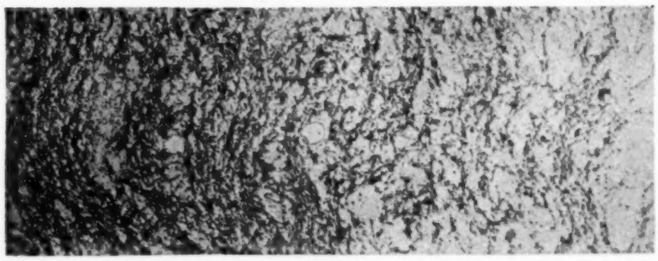
On one such job, grubbing trees, Homfield eliminated an entire fence row of trees to extend a farmer's productivity. The operation was simple, with the equipment Homfield had at his command. Knifing his way into the trees, Homfield simply lets his bulldozer bite into the base of the tree and shove it out, roots and all. He pushes it clear of the operations site and then, with the same equipment, fills in the holes and levels off the land for future operations.

Getting under the roots is the first step in this practical tree falling operation.

Many additional acres will be added to farmer's fields by such clearing.



GRADED DENSITY IN DEPTH



Photomicrograph shows progressively greater fibre density encountered by fluid as it passes from pressure surface (right) through depth of element to discharge surface (left).

MICRO-KLEAN *greatly extends the range of applications for Cuno Fluid-Conditioning*

With MICRO-KLEAN, Cuno — whose filters are used more by Industry than any other brand — offers you the equipment and engineering service to help you handle successfully almost any fluid-cleaning requirement.

Cuno's famous all-metal continuously-cleanable AUTO-KLEAN removes all particles down to .0035" from practically any fluids other than those containing highly abrasive solids. Cuno's wire-wound self-cleaning FLO-KLEAN is recommended for fluids containing large proportions of highly abrasive solids — mill river water, etc. Cuno's specially-designed COOLANT-KLEAN is for coolants used in precision grinding. Cuno's air filters remove unwanted solids, entrained moisture and oil from compressed air.

And now Cuno's MICRO-KLEAN extends the range of Cuno Fluid Conditioning down to micronic particles!

Cuno maintains a competent staff of engineers in twenty key cities across the country, who will cooperate with you personally and bring to you the active participation of Cuno's factory engineering staff. Sample fluid tests are conducted, either in our laboratory or in the field, upon arrangement.

Meanwhile, have us send you more information on Cuno MICRO-KLEAN. For convenience, use the coupon, listing the types of service in which you are interested.

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Complete range from ⅜" to 4" inlet and outlet connections, handling up to 300 gpm. Other sizes available soon.

MICRO-KLEAN CARTRIDGE SIZES

1" I. D. and 2¾" O. D. standard at present. Standard lengths: 4", 8", 10". Special lengths available for built-in installations or for housings already in service.

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- ☐ Fuel Oil, Diesel
- ☐ Water and Water Solutions
- ☐ Compressed Air
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- ☐ Fuel Oil, burner (Domestic and Industrial)

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NEW YORK'S LATEST DIESEL –ELECTRIC FERRY

By DWIGHT ROBISON

"THIS is one of the best looking and neatest arranged engine rooms I've ever seen," was the remark of a veteran marine engineer attending the inspection run of the new Diesel-electric ferry, *The Narrows* on August 26. This vessel is the first of two craft that will augment the service between Brooklyn and Staten Island, and the engineering executive was one of about 150 marine, press and business men who were aboard for the demonstration run.

When it is realized that the engine room is only 40 ft. long by 23 ft. between trusses, and has a deck width of but 18½ ft., it obviously was a problem for the designer to arrange 1,350 shaft hp. in the form of two General Motors-Cleveland eight cylinder Diesels, two main generators and two electric propelling motors with one reduction gear—plus all the auxiliary equipment. Each of these two Diesels delivers 800 bhp. and drives a 540 kw. generator at 750 rpm. top speed. Current from the power units operate two 685 hp. propulsion motors at 700 to 875 rpm. A single propeller shaft runs the entire length of the hull and is turned through a Farrel-Birmingham reduction gear at 160 to 200 rpm. There is a bronze propeller at each end of the shaft, one right handed and the other left handed. With two engines at full load a speed of 12.8 knots can be maintained, or 8 knots with one engine.

Prow view of "The Narrows" showing spacious deck accommodations for automobiles and trucks.

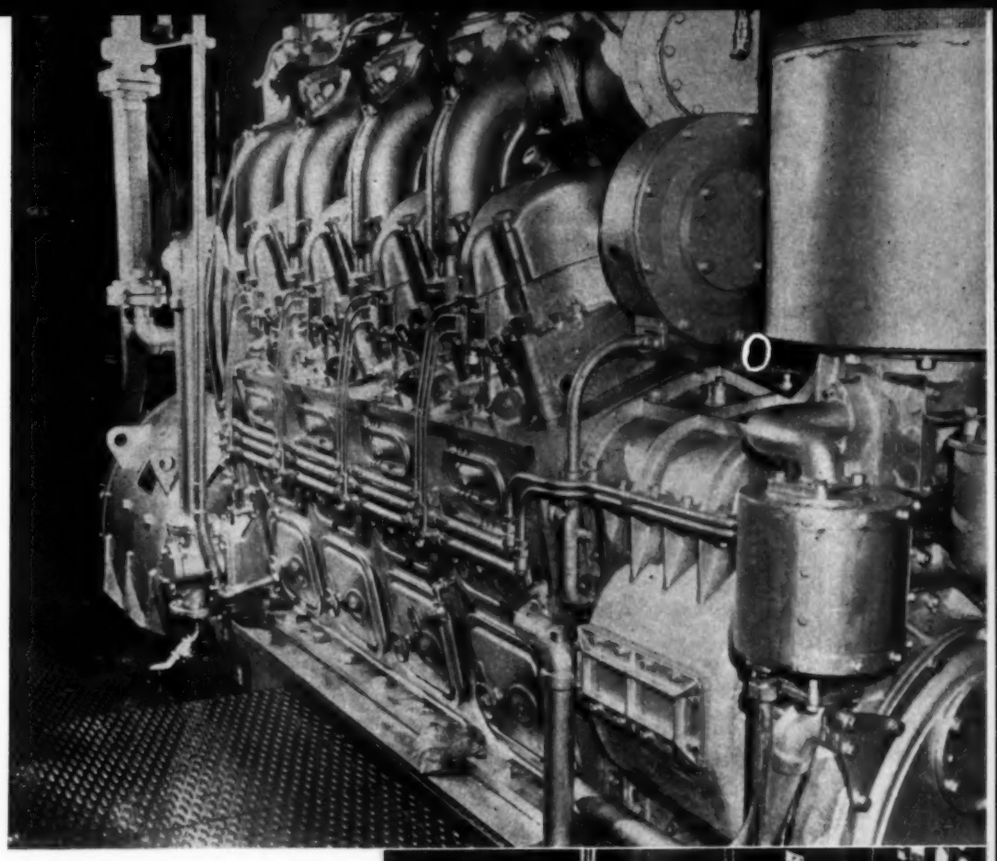
The Narrows was built by the Jacobson Shipyards, Inc., Oyster Bay, New York, from designs by Eads Johnson for the Brooklyn and Richmond Ferry Company, affiliate of Electric Ferries, Inc., New York, N. Y., and a sister ferry is under construction at the same yard. E. G. Diefenbach is the president of the owning company. Straight line construction was used throughout, effecting considerable ease and economy in fabricating the hull, at the same time providing maximum stability by increasing the tons-per-inch immersion at the load waterline.

Greater horsepower is installed in *The Narrows* than in any of the existing Diesel-electric ferries operating in the Narrows, and on the North River, and she has greater speed.

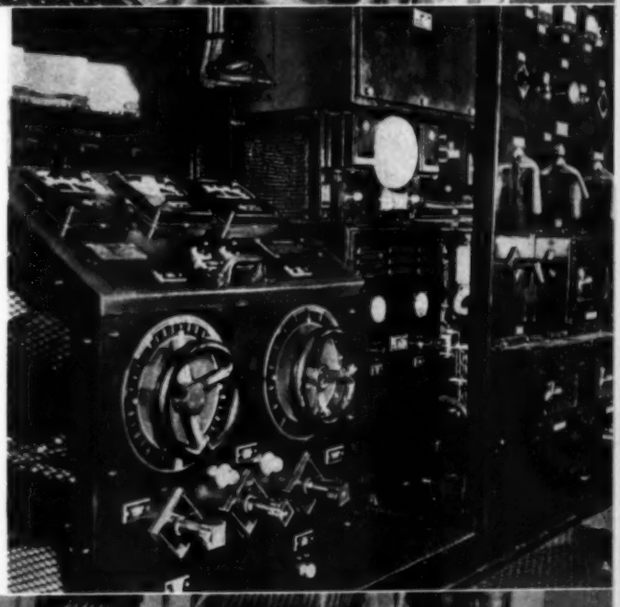
Dimensions of *The Narrows* are: Length oa, 185 ft.; length wl, 183 ft. 8 in.; width over guards, 54 ft.; depth 15 ft. 6 in.; while her displacement at 9 ft. 6 in. draft is 690 tons. Her G.M.-Cleveland Diesel engines are two-cycle, V-type. Electric control of the propelling machinery is from whichever of the pilot houses —at the two ends of the passenger deck—happens to be in use. Steering is by means of a small lever, the large hand-powered steering wheel in each pilot house being for emergency use and is not normally required. But, one rudder only is operated from each pilot house, the forward rudder driving motion being locked before the start of each run. The ferry, of course, is double ended.

On the port side of the engine room are located two Ross lubricating coolers; fresh water cooler and tank; fresh water and salt water sanitary units of 30 gallons capacity each; heating boiler; auxiliary bilge pumps; duplex strainer; fire and bilge pumps of 250 gallons capacity; Briggs lube oil clarifier; sludge tanks and the 10 kw. General Motors auxiliary Diesel-generating set. On the starboard side are the fuel oil service pump; fuel oil transfer pump; work bench; sea chest; another lube oil clarifier; engineers log desk; switchboard; storage batteries; a De Laval centrifugal lube oil purifier; lube oil cooler and a fresh water cooler.

Among the guests on board during the demonstration run was Stephen P. O'Regan, director of ferries of the New York City Department of Marine and Aviation, who represented Mayor O'Dwyer and Commissioner F. G. Reinicke. Mr. O'Regan stated that the City of New York has just purchased four powerful tugs, all equipped with G.M.-Cleveland Diesel-electric drive.

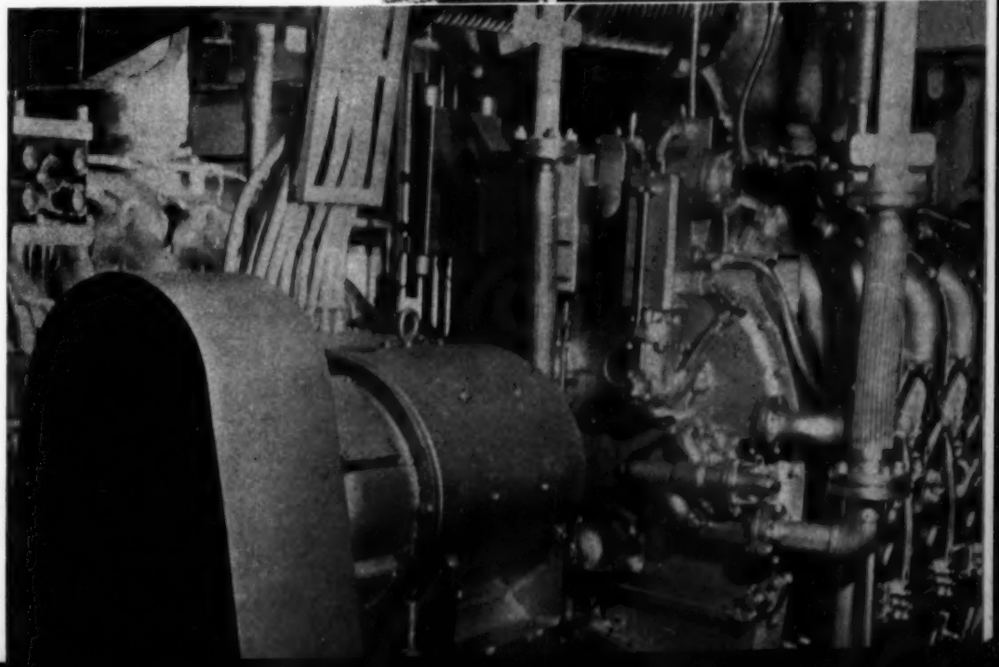


One of the two General Motors, 800 hp. main Diesels that power "The Narrows."



Engine room control panel and main switchboard.

General engine room view showing both main Diesels, and one of the 540 kw. Allis-Chalmers generators in the foreground.



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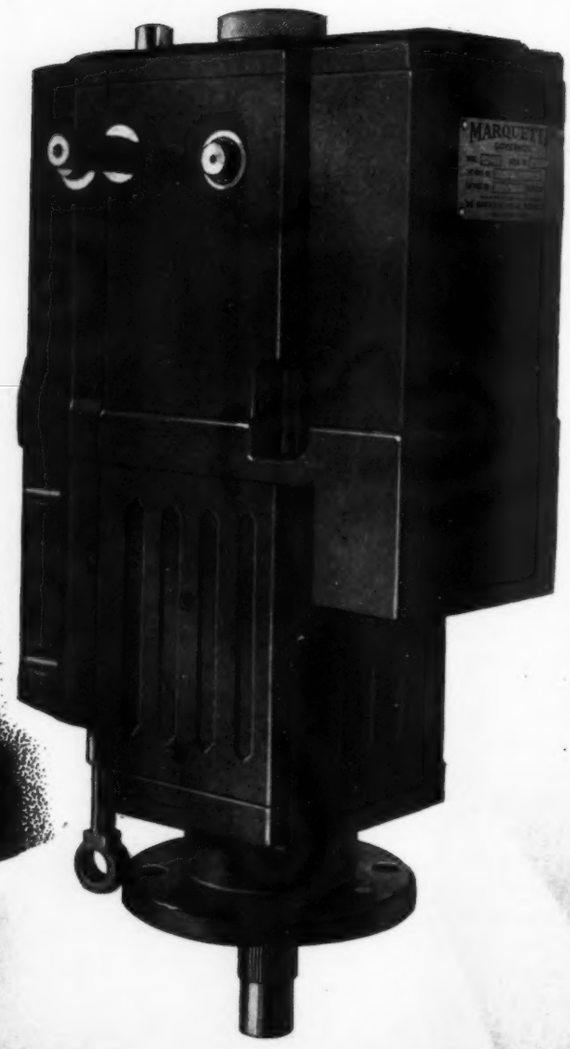

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* Vice-Pre
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DIESEL ENGINES ON RAILROADS

By L. W. METZGER*

THE rapid advance in the use of Diesel electric locomotives in the transportation industry is the greatest compliment that has yet been paid to the reliability and the usefulness of the Diesel engine since its invention by Rudolph Diesel. To the youth of the land, the railroad locomotive of the future is no longer a locomotive with a smoking stack and large driving wheels, but is the streamlined Diesel locomotive, and that same feeling is prevalent with the majority of the people on the street.

From boyhood the ordinary individual is a locomotive enthusiast. If you are in the business, people buttonhole you at public gatherings or corner you in hotels just to tell you of their interest and they are one and all, fluent in the argot of the trade. For this reason public opinion about locomotives is important and the railroad traffic men recognize this fact and are influenced accordingly.

To be sure, modern locomotives, whether steam or Diesel, bring the trains in on time but usually the Diesels get the credit. The record of availability of Diesel locomotives is constantly improving and any builder who can't produce an availability factor for his locomotives of 93% or more is on the defensive with the railroads. One railroad president stated that a Diesel road engine had pulled one of his crack trains for two years without missing a trip for which it was scheduled.

The purchase of road Diesels by the large coal hauling railroads indicates that Diesels have earned a position where they are of interest to railroads which would normally use coal as fuel. The necessity of producing the very best transportation appears to make it necessary to include at least some Diesels in the locomotive pool.

In attempting to appraise the value of Diesels one difficulty frequently arises; namely, the unfair comparison between new Diesel power and old steam equipment. Witness the situation in Mexico. The availability and performance of the Diesel locomotives in that country have at times been embarrassing. New Diesel locomotives were assigned to a run where the trains had always been running several hours late. It is the custom in a part of Mexico for the passengers to purchase food at the stations along the line and when trains began to arrive on time the food was not ready and dissatisfied passengers and worried food dispensers were the result. This situation was soon remedied, however, because trains continued to run on time with modern Diesel power and matters of food were adjusted accordingly.

In the field of road power there is room for both the steam locomotive, the Diesel and any other prime mover now in the development stage. Modern steam locomotives have a performance comparable to the Diesel except as to thermal efficiency and against this Diesel advantage there are a number of offsetting factors. In some places like the West where water is difficult to obtain, and in some services such as the long, non-stop passenger runs, the Diesel locomotive has the preference. In the East where coal is plentiful, the run is shorter and the duty heavier, steam locomotives will continue to have the call. However, on the coast to coast runs which were initiated earlier this year and which will rapidly develop into service which will compete with the airplane, undoubtedly the same Diesel locomotive that leaves New York City will be pulling the train when it arrives in San Francisco.

The field of switching has gone almost entirely over to the Diesel. The differential in the performance of the Diesel which includes availability and low cost of operation, make it so much superior to the steam switcher that the market for steam switchers has gone. So far as I know, there have not been any steam switchers sold by any of the larger locomotive builders in this country in the last two years, whereas, several hundred Diesel switchers have been put into service. The factors of availability, lower standby losses, less cost of maintenance and ability to pull excess loads for short periods, all contribute to the outmoding of the steam switcher and the adoption of the Diesel.

In the early days of the Diesel locomotive, the railroads had very few maintenance facilities and it was necessary for the manufacturer to provide maintenance service far beyond normal. The manufacturers were wise in providing this service because it was by means of it that the Diesel locomotive was able to arrive at its present status. In fact, a few years ago when one of the streamliners arrived at a terminal, so many men swarmed about the lady to attend to her every need that the steam people called the Diesel the courtesan of the rails. However, conditions have become normal now and the railroads are doing an excellent job of maintaining this type of power which was so strange to them in the beginning.

A word on the gas turbine competition is timely. The gas turbine is in the early stages of development. Although it is unwise to make predictions, it seems to me that it will be some years yet, under the most favorable conditions, before gas turbine power will be available commercially and advantageously to the railroads. At the present time the gas turbine has approximately double the fuel consumption of the present day Diesel engine. It loses power fast on altitude and about the only advantage it has over the Diesel is the possibility of reduced maintenance. We should not, of course, be blind to the new possibilities in the gas turbine but at the moment it does not seem likely to immediately supersede the modern Diesel locomotive of today.

Studies are being made on both oil burning and coal burning gas turbines. If the unrest in the mines has now become a yearly occurrence and the cost of coal continues to increase, there will be less and less coal used in motive power.

To conclude, the future of the Diesel locomotive is very bright. Diesel locomotives will be used in the fields of road power, branch line service, transfer service and switching. The development of this power is proceeding at a fast rate both in the introduction of new locomotive types and simplicity of engines. These improvements include increasing fuel and water carrying capacity, the development of larger heating boilers, simplification of control and many other advantages too numerous to mention. There is nothing static in the Diesel locomotive field. The market is there and we in the Diesel industry can all feel that we are rendering a valuable contribution to the advancement of transportation in the United States by doing our best to aid the industry.

* *Vice-President, Operations, Eddystone Division, The Baldwin Locomotive Works.*

VANDERBILT YACHT REFITTED FOR SOU

By FRED M. BURT

IT was very interesting, that trip down to California's Newport Harbor with John E. Walters, Vice President and Sales Manager of Los Angeles' Bardco Sales and Mfg. Co., to visit the Vanderbilt yacht, *Pioneer*. We had received word that if we wanted to examine the ship, take some pictures and obtain data on the equipment, we had better do it pronto.

Captain Walter Hart had just been wired orders to be ready to sail in two days on the scheduled scientific expedition into the South Seas, and much work was yet to be done. The next day owner George Vanderbilt arrived from the east on a large chartered plane, but not alone. The following news item (from "Time") explains the reason that this scientific expedition was doubling as a honeymoon cruise.

MARRIED. George Vanderbilt, 31, multi-millionaire sportsman, explorer, big-game hunter, ex-PT boat commander; and Anita Zabala Howard, 41; both for the second time; at Arcadia, the Vanderbilt plantation in Charleston, S. C.

Mr. Vanderbilt is a Director of the Museum of the Academy of Natural Sciences of Philadelphia which was founded in 1812 in connection with the organization of the society. This was for many years the most important scientific society, so far as natural history was concerned, in the United States. Mr. Vanderbilt has supplied the museum with many valuable specimens of fish and bird life.

Buying the *Pioneer* in 1938, (German-built in Kiel in 1929) the yacht was outfitted for scientific expeditions and was powered for auxiliary propulsion with a General Motors Diesel engine, 10 in. bore x 12 in. stroke, and developing 400 hp. at 450 rpm.

With Captain Hart the *Pioneer* made its first long cruise in 1941 to the Windward Islands and other points in the Caribbean and the West Indies where Mr. Vanderbilt personally collected many valuable specimens. Then through the Panama Canal to the Galapagos and other islands in that Pacific area, thence to San Pedro. In 1942 Mr. Vanderbilt turned the *Pioneer* over to the Navy when he himself entered the Naval service. She served as a patrol boat and dispatch ship until the end of the war when the special gear and furnishings were removed and she was left in the care of Capt. Hart at Newport Harbor.

Returned to Mr. Vanderbilt in November 1945, the *Pioneer* has been undergoing a complete overhauling and re-fitting at Newport Harbor at a cost of some $150,000.

The *Pioneer* is 173 ft. long, with 28 ft. beam, 327 gross tonnage, 126 net, and draws 18 ft. fully loaded. Schooner-rigged, and reputed once to have carried the most sail of any two-masted schooner, although this has since been reduced, she still carries a huge expanse of sail. However the Diesel engine has been, and will be used extensivly. Driving a 38 in. diameter, 50 in. pitch, bronze, 3-blade propeller, direct-connected to turn at engine speed, on a recent test run, according to Chief Engineer Orton (ex-Warrant Machinist and group engineer in charge of maintenance and repair for groups of Naval craft), the *Pioneer* logged 13.2 knots in a cross wind propelled by the engine only.

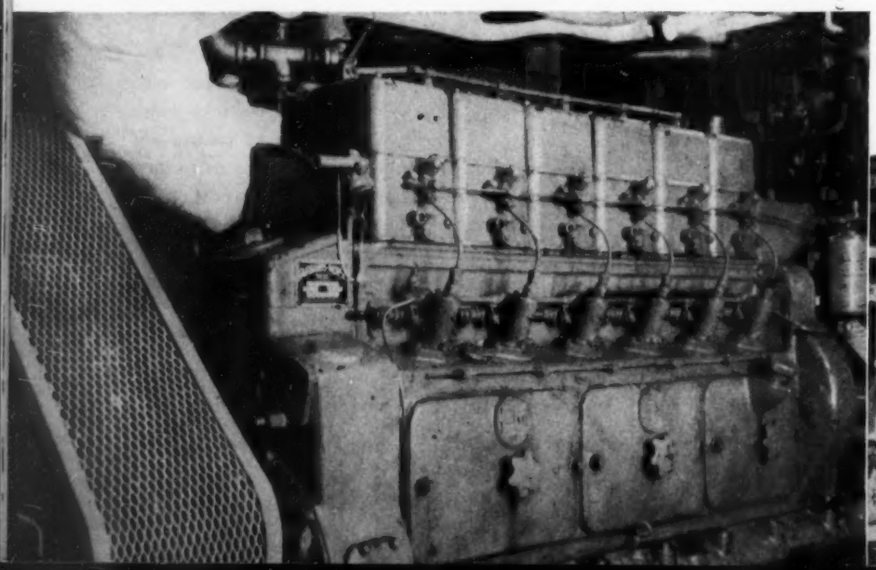
The layout and arrangement in the engine room is the ultimate in compactness; particularly after the addition of much new auxiliary power equipment. Just above the forward end of the main engine is a very compact and complete engine instrument panel. An arm's length away on the port side, and just beyond a narrow passageway giving access to the starboard side of the main engine there is another very compact and excellent unit, the switchboard and distribution panel.

Just forward of the main engine, on each side, there are two Fairbanks-Morse, 6 cyl. 90 hp. 900 rpm. auxiliary Diesel engines.

Each of these engines is V-belt connected to a 60 kw. Bardco Diesel generator set. A control panel provision is made for paralleling these generators. Another 15 kw. tailshaft Bardco generator is belt-driven from the main engine flywheel while the main is in operation. In port it is used as a motor generator set, driven by a 20 hp. A.C. motor hooked up to shore A.C. power lines. All three generators are provided with voltage regulators and reverse current relays.

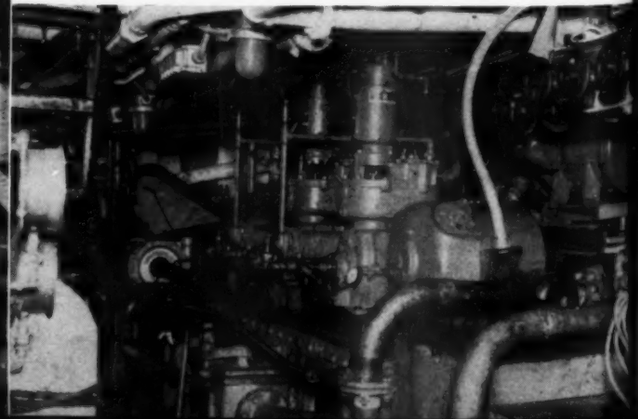
These generators supply current for six Bardco DC motors. One 15 hp. unit operates the Fire Pump and is equipped with a magnetic starter, four speeds, and is controlled from two stations, one in the engine room and the other on deck.

Two 7½ hp. motors operate compressors and the large amount of refrigerating equipment used to preserve food and drink (there being about $10,000 worth of supplies for the trip including about 3,000 lbs. of meat), and collected specimens. Two 7½ hp. motors operate the starting air compressors for the main pro-



(Below, left) One of two 6-cylinder, 90 hp. Fairbanks Morse auxiliary Diesel engines which drive the 60 kw. Generators.

(Below) Two refrigerant compressors are seen in center of picture. They are driven by Bardco DC motors.



SOUTH SEAS EXPEDITION

pulsion Diesel engine. And a 5 hp. motor operates the bilge pump.

The battery room contains a double bank of Exide batteries with 600 ampere-hour capacity. In the galley the large German range is fired with Diesel fuel using a compact Ray burner and blower unit. On each side two davits carry a 26 ft., 19 passenger lifeboat and a 27 ft. ChrisCraft cabin cruiser.

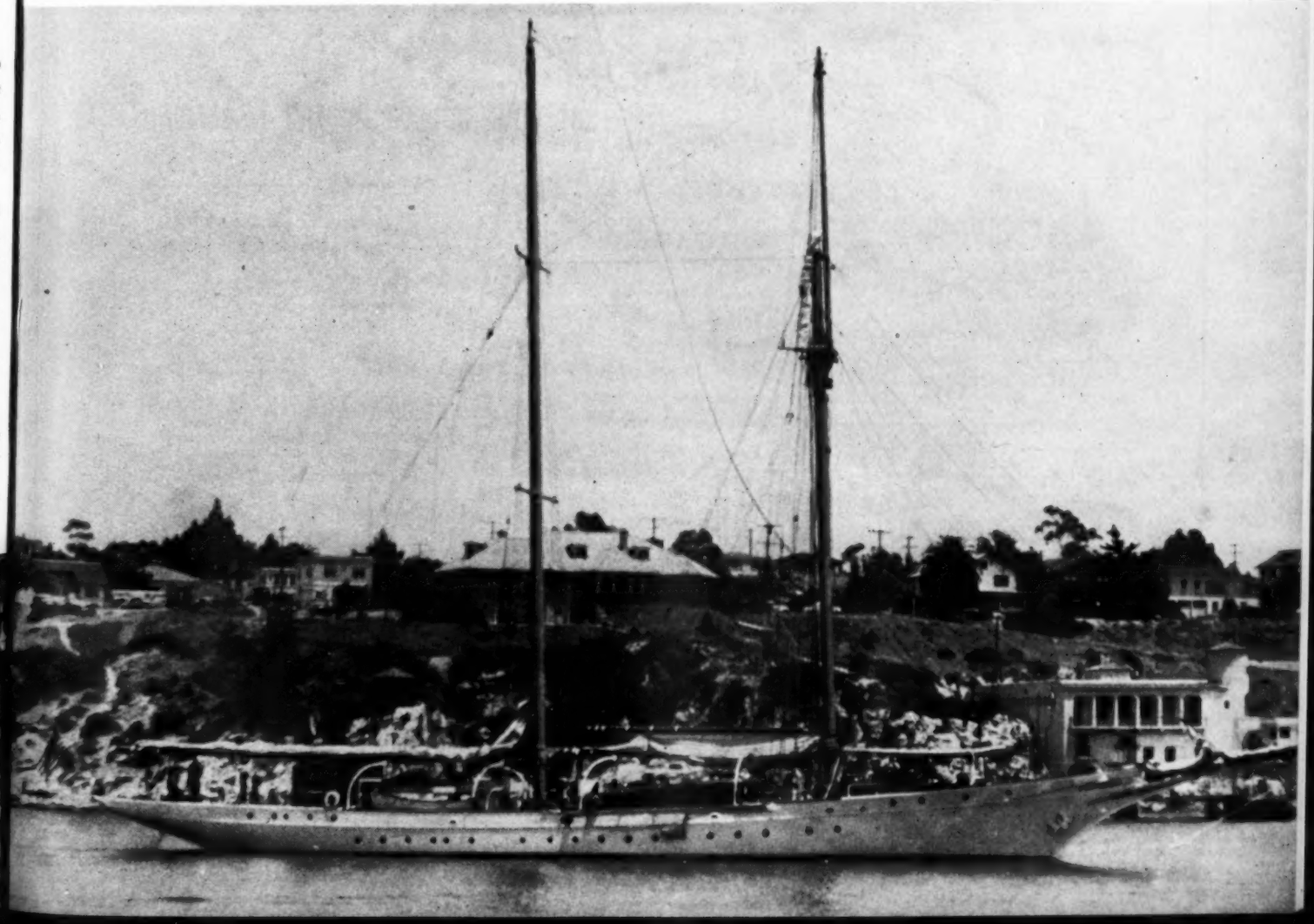
The ship's complement consists of the Captain, Chief and second and third mates; Chief Engineer, first and second assistants, and two oilers; a "bos'n" and 10 seamen; a Steward and his crew of six.

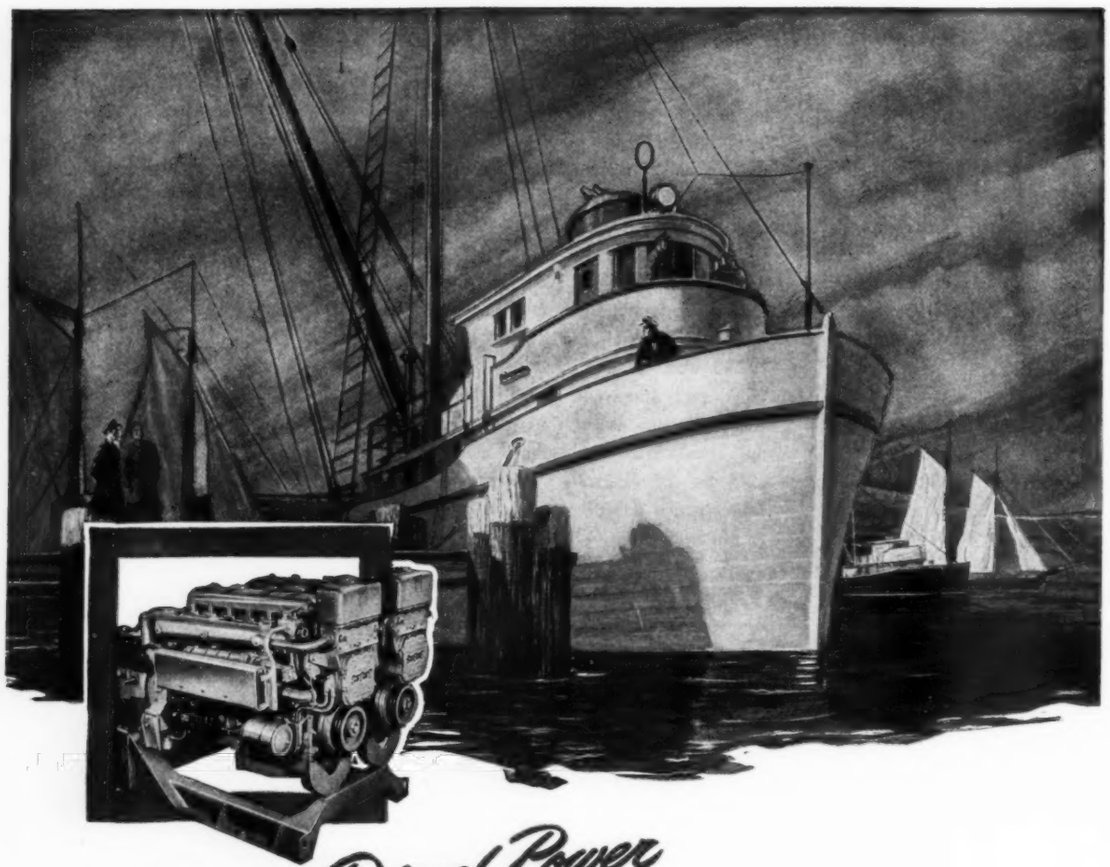
The ship's officers have staterooms amidships with the crew in commodious quarters forward. Aft is a luxurious lounge room with large library, the master's bedroom and full-sized bathroom, two twin-bed guests bedrooms with baths, specimen room, office and other accommodations. All beautifully panelled in hardwood. On the after deck is another lounge room. All adding up to the last word in personal luxury on shipboard.

The *Pioneer* will be well equipped for her long ocean jaunt westward to the exotic islands of the Pacific. Although many of picturesque islands were ravaged during the late war there are literally hundreds more that remain undisturbed by the flux of time and events. There are natives that still trade in native currency and not in American cigarettes, and marine fauna which has not felt the terrifying shock of underwater explosions.

"Skipper" Vanderbilt will not have to worry about his shipboard power installation when he weighs anchor on his way to Tahiti, Samoa or Tongatabu or wherever he may wish to go. The *Pioneer* with 400 Diesel hp. will make it.

Vanderbilt yacht "Pioneer," 173 feet overall, with a 28 foot beam is shown leaving Newport City Dock recently after a complete overhaul





For Great Diesel Power

—set your course by the fisherman

FISHERMEN make their money by getting back fast with the most fish at the least cost. There's no profit in hauling around big, heavy engines that take up a lot of room.

So every day sees more and more General Motors Diesels going into fishing boats. And for good sound reasons.

These Diesels pack more power in less space—weigh less than older types. *So GM-powered boats carry more fish.*

GM Diesels get efficient combustion from low-cost fuel—keep going day after day with the least maintenance.

Add these features to the reduced fire hazard, easy starting, quick availability of parts and service, and you see that GM Diesels have features that are valuable everywhere power is needed. That is why they're taking over so many jobs that Diesels never handled before.

So whether your power need is for boating, transportation, drilling, pumping, road-building or anything else, it will pay to get all the facts on the General Motors Diesel.

Features of GM Diesels Important to Every User of Power

- ***QUICK TO START*** on their own fuel
- ***LOW COST***—run on common fuel oil
- ***EASY TO MAINTAIN***—clean design plus accessibility
- ***LESS FIRE HAZARD***—no volatile explosive fuel
- ***COMPACT***—readily adaptable to any installation
- ***SMOOTH OPERATION***—rotating and reciprocating forces completely balanced
- ***QUICK ACCELERATION***—2-cycle principle produces power with every downward piston stroke

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GENERAL MOTORS
DIESEL POWER

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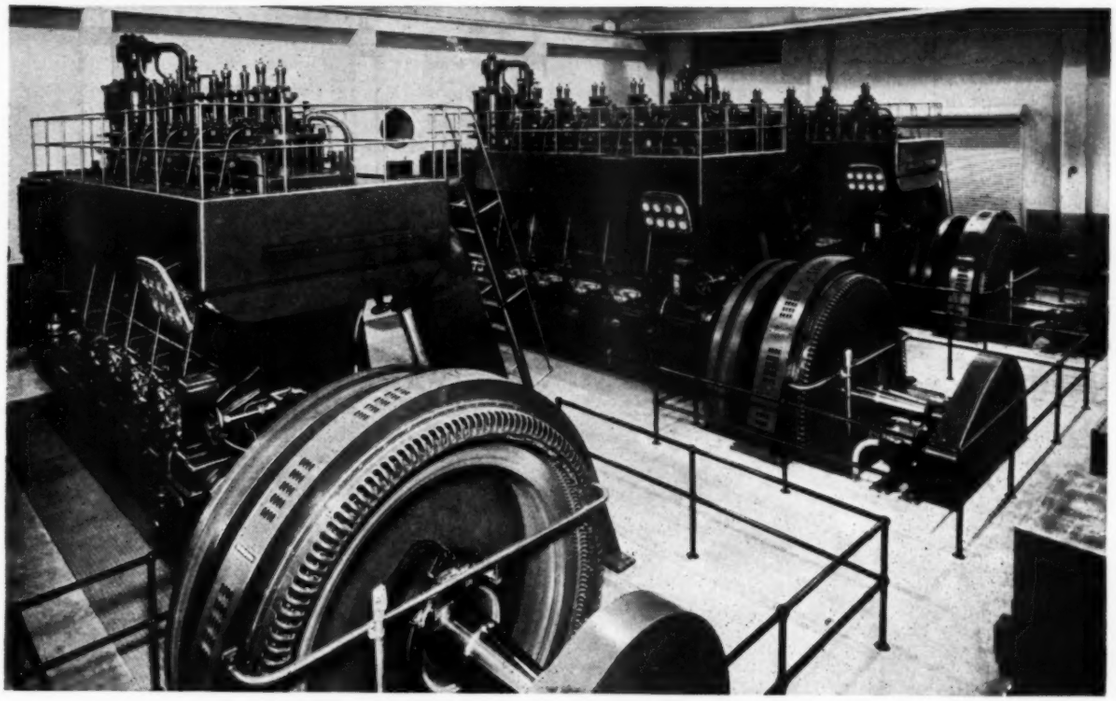

. . . LOW KILOWATT COST

If kilowatt cost is high, investigate engine lubrication. Lubrication can be a pertinent factor in cost of power output.

Sinclair GASCON OIL fights for low kilowatt cost. It discourages engine breakdown, overhaul, unproductive shutdown time; it encourages top efficiency and maximum output. Inherent properties of the oil give it natural ability to disperse carbon formation, to keep crankcase accumulations to a minimum and prevent ring sticking.

For a *clean engine,* effective lubrication for low maintenance cost, continuous full power output—try Sinclair GASCON OILS—proven lubricants for Diesels.

SINCLAIR INDUSTRIAL OILS

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SUPERVISING & OPERATING ENGINEERS' SECTION

Conducted by R. L. GREGORY

"TROUBLE SHOOTING" PART 6

CONTINUING our discussion of the above subject, which was inadvertently interrupted in the last issue, let us take up the following points as they affect trouble shooting in a unit.

Temperature of Piston Cooling Oil Becomes Excessive

There are several causes for such a situation and are as follows:

(a) Insufficient cooling of the oil by the oil cooler.
(b) Circulating oil pressure inadequate.
(c) Overloaded cylinders.
(d) Defective lubricating oil pump.
(e) Leakage.

We are all aware of the necessity of keeping the proper temperature for piston cooling oil in operation in order that the piston may not become overheated and either seize or score the liner wall and piston. All engines are equipped with a heat exchanger of ample size to properly cool the lubricant. But ofttimes these coolers become scaled up or clogged with foreign matter, so that the passages do not allow ample circulation to properly cool the lubricant. In a previous issue of *Diesel Progress*, a method of cleaning the tube bundles was fully described and periodical checkups should be made of these coolers to see that ample cooling agent is circulating through the cooler to keep the lubricating oil at proper temperature at maximum load of the unit.

One can easily determine this situation by having a temperature indicator before and after the cooler. By comparison of these readings, the amount of heat transfer from the lubricating oil can be determined and one can readily tell whether sufficient cooling agent is circulating in the heat exchanger. Sometimes where the cooling agent is taken from a pond or small lake, where the cooling agent temperature rises to excess in summer weather, the heat transfer in the cooler will be limited. This can be determined by checking the temperature of the cooling agent before it enters the heat exchanger.

Again, the circulating oil pressure may be too low. In such an instance it should first be determined whether there are any leaks in the lubricating pipes leading to the piston, in the header supplying these pipes, or in any of the bearings, whereby pressure is decreased. Ofttimes in some units, orifices are inserted, the size of which is determined by the cut and try method. These orifices are placed in the discharge line from the piston, in order that the pressure may be built up in the piston head.

The second condition to note is whether the relief valve on the lubricating oil circulating pump is properly functioning. Sometimes these valves become sticky and do not function properly. Springs become weak after long periods of use or become gummed up and do not function properly. Valves and seats become worn and cut and do not properly maintain pressure. This pressure varies with the size of the unit, but on large units such as we are discussing, a minimum of approximately 40 lbs. should be carried, in smaller units this may be lessened. Therefore it is good practice to occasionally dismantle these relief valves and check their condition.

Of course an overloaded cylinder on a unit, would cause the temperature in that particular cylinder to rise above normal operating temperature. Therefore it is important to see that the load which the unit is carrying is evenly distributed among the various cylinders. This can generally be controlled by adjustment of the control rod on the fuel pump.

Again there is the matter of proper functioning of the lubricating oil pump. If the pump should for some reason lose its suction, the flow of oil to the piston head would stop and the temperature of the cooling oil would rise rapidly. This might be due to insufficient oil in the sump, from which the pump is supplied.

One of the principal parts of an air injection unit is the compressor which has three stages of compression, namely the low, intermediate and high stages. Where the compressor is an integral part of the unit and driven from the main crankshaft, it is very important that a systematic periodical inspection is made of the various parts of the compressor. Since these various stages are equipped with both suction and discharge valves, and these valves in turn are composed of several parts, it is important that each and every valve, valve seat, spring, etc., be kept in good mechanical condition.

On such an engine, the air is taken from the air intake piping by means of a scavenging pump, through the scavenging valves. It is also important that these scavenging valves be kept clean and free from clogging.

Now let us follow the air through the various stages of compression, remembering that we are discussing an air injection unit of 2250 bhp. Starting with the low pressure suction valves the air is drawn into the low pressure stage, out through the low pressure discharge valve to the low pressure cooling coils, through these coils to the intermediate suction valves, thence through the intermediate stage, out through the intermediate discharge valves to the intermediate cooling coils, thence to the high pressure suction valves, through the high pressure stage, thence to the high pressure cooling coils and on into the blast bottles.

Each stage is equipped with gauges, the low pressure stage operating at from 40 to 60 lbs. per square inch, the intermediate stage at from 200 to 260 lbs. per square inch and the high pressure or blast air at from 600 to 1100 lbs. per square inch. Now the pressure in these various stages will vary with the load and will vary proportionately one with another. After one becomes familiar with the proper operating pressures of these various stages, he can ascertain whether the compressor is losing its efficiency by checking the various pressure relations. This is generally the best way of determining whether the compressor valves need attention, and whether there are any leaks from one stage to another.

Another important item is the periodical checking of the cooling coils for the various stages. These should be given a hydrostatic test at twice their working pressure. For instance, if the working pressure on the low pressure stage is 50 lbs, to the square inch, the test should be made at 100 lbs; if the intermediate stage working pressure is 250 lbs. these coils should be tested at 500 lbs.; and if the high pressure stage or blast pressure works at 1100 lbs. they should be tested at 2200 lbs.

• *Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.*

GAS ENGINE LUBRICATION

Patented Instrument Guides Elimination of 3% Fuel Waste

IMPROVED EFFICIENCY PERMITS 14 TO 32 THOUSAND HORSEPOWER HOURS PER GALLON OF LUBRICATING OIL

Lubrication Engineer's Report

Since 1940 a prominent Midwestern gas company* has been using the patented Cities Service Heat Prover to check the efficiency of their 20 gas engines.

"Early Heat Prover readings showed a 3% fuel waste under full load. Constantly using the Heat Prover to gauge combustion efficiency, corrections were made and maximum fuel utilization was achieved.

"The following recent check on 8 of these engines shows the unusual results. And they're still going strong. The general average on all of these engines is 14 to 32 thousand horsepower hours per gallon of lubricating oil . . . Cities Service Sentry No. 9 and No. 6."

Engine # 9	**Engine # 14**
Operating Hours Right Side 22006	Operating Hours Right Side 17843
Left Side 22006	Left Side 25002
Liner Right Side 80619	Liner Right Side 30511
Liner Left Side 22006	Liner Left Side 30511
Engine # 10	**Engine # 2**
Operating Hours Both Sides 19353	Operating Hours Right Side 17635
Liner Right Side 42183	Left Side 17635
Liner Left Side 42183	Liner Right Side 17635
	Liner Left Side 17635
Engine # 11	**Engine # 6**
Operating Hours Right Side 15324	Operating Hours Right Side 14189
Left Side 24979	Left Side 17627
Liner Right Side 15324	Liner Right Side 35809
Liner Left Side 24979	Liner Left Side 14189
Engine # 13	**Engine # 7**
Operating Hours Right Side 16968	Operating Hours Right Side 14332
Left Side 24448	Left Side 22556
Liner Right Side 24979	Liner Right Side 30901
Liner Left Side 24979	Liner Left Side 30901

The Cities Service Industrial Heat Prover has been used successfully with every kind of fuel and with every type of combustion equipment in this country. It indicates simultaneously the percentage of unburned fuel and oxygen present in flue gases. With this data the trained Cities Service engineer can show you at once how to *save* on fuel costs and improve efficiency.

Engineering Service Available

Cities Service Lubrication and Combustion Engineers know ways and means for reducing costs and improving the performance of lubricants. For help or information call the branch office nearest you or write Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y. (Arkansas Fuel Oil Company, in the South). *Name on request.

CITIES SERVICE OILS
ONCE-ALWAYS

FOR EVERY LUBRICATION PROBLEM

CALL Cities Service FIRST!

Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

WITH the cessation of hostilities and the advent of V-J Day many a plant engineer and maintenance man heaved a heavy sigh of relief and said to himself, "Well it won't be long now, before I can again secure replacement parts for my units and again have them in first class operating condition."

But the writer, though not inclined to be pessimistic, is still afraid that many of us are doomed to disappointment along that line, and that the procurement of badly needed parts is going to get worse before it gets better. As the days go by, deliveries of these materials get scarcer and farther apart. Today you place an order for some badly needed replacement parts and after several days you may get an acknowledgment of your order with a notation that the material required will be shipped anywhere from six to eighteen months from date of entering, and that contingent upon strikes and the procurement of materials.

When a plant engineer or maintenance man, who has struggled during the actual war period to keep his units in operation by every means his ingenuity could devise, often resorting to unorthodox repairs which even he himself had no faith in, is faced with a situation of that sort, it is not conducive to good morale, nor to further extended effort on his part.

On the face of the thing it is a deplorable condition. With a country rich in materials and mechanical ability to say nothing of engineering ability, which during the world crisis produced materials in vast quantities to win the war, it truly is a serious situation when they can not produce the materials we need for reconstruction. Therefore it seems that something ought to be done about the situation.

Perhaps many of us are partially to blame for that situation. Not many days ago a salesman, who has been calling on the writer for several years, made one of his periodical calls and after passing the time of day, inquired of the writer as to whether he was in need of any repair parts. Reaching into my file I produced an order which was placed with his firm in March of 1945, and which had only been partially filled. This order called for a minimum of parts, which had been ordered with the thought in mind, that from past experiences would be required before the year was over.

This salesman then went on to explain that due to long drawn out strikes in several of their plants, many of the articles had not been produced. That they were now functioning and again producing these items, but that their backlog upon these parts had piled up to such an extent, that they had thousands of orders for them, resulting in the rationing of these parts which were now available. He said, "You know there are hoarders in the power plant game the same as in foodstuffs or any other items. Many engineers are prone to pile up inventory stocks of materials which they will sometimes require but are not in actual need of at the moment. This brings up a confusing situation with us and we do not like to disappoint our old customers."

Well, this salesman might have something in that statement. It is true, that many engineers and plant maintenance men, try to protect themselves by over ordering these replacement parts. And while one cannot criticise their zeal in having parts on hand when required, there really isn't any sense in ordering enough parts to last for years, when they could get by with a six months' supply and anticipate their needs far enough ahead, ordering smaller quantities more often. This would give the manufacturer a chance to serve more customers with enough parts to keep them operating in fair shape and make it easier for all concerned.

On the other hand one must take into consideration the materials and the life of the same in replacement parts today as compared to prewar parts. Let's just take one item for instance, the item of piston rings. The writer is not familiar with the situation as it exists all over the Diesel field, but it is true that engineers in many plants in the midwest are having more than normal troubles with piston rings. Rings do not seem to be breaking up, and the complaint is not on that point. The chief complaint seems to be the matter of ring tension. Many rings procured today seem to lose their tension after a few weeks of normal unit operation and as a consequence, rings have to be changed more often than formerly, since with loss of tension, blowby occurs.

From our own experiences, the writer can truly state, that rings we are using today under identical loads and conditions formerly existing in the early war years, are not standing up as they did. A few months ago, in fact during the early spring we made our annual inspection and in so doing equipped each piston with a new set of rings, with the exception of one piston. On this piston we installed a set of prewar rings which had had a year's operation but which still had sufficient tension and strength and which we had set aside as an emergency set, they being too good to discard. In checking over the unit the other day with an indicator, this piston, equipped with a set of used prewar rings, was in better shape and had better compression than any of the other pistons, and ironically enough several of the other pistons have already had to have rings replaced since the annual overhaul, due to loss of tension.

This fact alone goes to prove that materials are not of the quality that they once were, and if the situation does not improve, the only thing an engineer or maintenance man can do, is to keep a supply of rings on hand and change htem oftener. However this is an expensive proposition and one which should have the manufacturer's attention. In the midwest this complaint has been voiced by plant engineers.

As with piston rings, so the situation exists in many other replacement parts, such as wiper rings, compressor valves, springs, etc. So it is up to the plant engineer and maintenance department to study this situation and make a complete record of maintenance changes and costs, and from these they can determine as to what quantities to order and keep on hand. At any rate, let's not hoard on this material and let's keep on hand only those parts, necessary for economical operation. This will give the other fellow a break and we can procure a more even distribution of replacement parts.

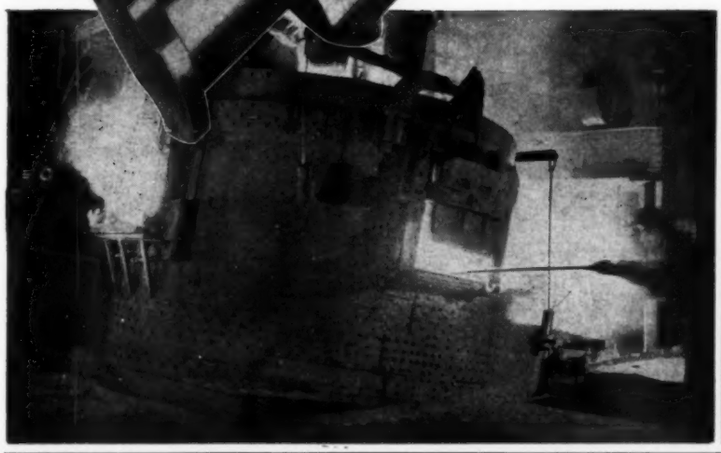
WHAT ABOUT THE *STEEL* IN THE *FORGINGS* YOU BUY?

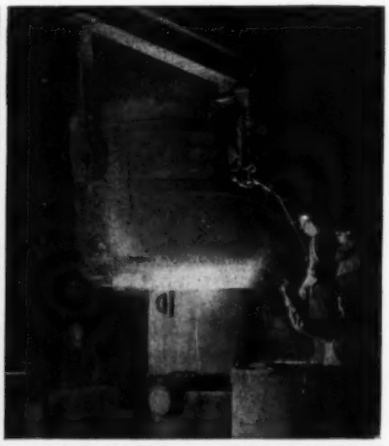
This Diesel locomotive crankshaft requires steel of the highest quality to perform its exacting duty in railroad service.

Every heavy duty forging has a tough job to do—that is why a forging is used. To do the job well it must possess definite prerequisites. First and foremost it must be made of high quality steel. The steel should be of clean homogeneous structure free from injurious defects and inclusions. The chemical analysis should be held within the specification limits and the grain size should be suited to the job. Do you make sure that you get this kind of clean steel in the forgings you buy?

NATIONAL FORGE MAKES ITS OWN STEEL

as the only way it can assume complete responsibility for the quality of the forgings it makes. At National, Heroult Basic Electric melting furnaces are used, thus producing steel with low sulphur and phosphorous contents. The grain size, abnormality and hardenability are more uniform and with close laboratory control over the steel making, high quality steel is obtained. With modern equipment available for extensive testing, including Magnaflux, the quality of the steel is assured. If you want to know that you are getting quality steel in your forgings, why not consult with National Forge?





NATIONAL FORGE & ORDNANCE COMPANY

IRVINE, WARREN COUNTY, PENNSYLVANIA

"TENCH," *(Continued from page 64)*

point it, of course, became necessary to revert to precise turns for desired speed.

A battery charge following near exhaustion of the "can" remained urgent. In this case, propulsion requirements allowing, the "starting rate" was poured in on two engines, whereby the very high current required for that rate plus the "auxiliary load" could be generated.

Intermediate charging rates were accomplished on one main engine. The long, slow "finishing rate" was usually relegated to the "dinky." Since a genuine "equalizing charge" could seldom be put in under patrol conditions, the battery was given one hour of "overcharge" each week. This, again, was performed by the "dinky."

In fact, as the war developed, our periods of submergence and performance while on the "can" seldom justified a real charge. The *Tench* was typical in processing the battery by mere "300 amp. positive floats" on the "dinky." Here, when the cells were down only some 50 points, the "dinky" would simply chug away, for hours if necessary, handling the "auxiliary load" and charging at a 300 amp. rate.

The small auxiliary engine was indeed a workhorse, sensible but very sensitive. She had several critical speed ranges which had gingerly to be avoided. Her timing was touch-and-go; any but the most expert loading tended to send sparks and globules of after-burning fuel out the exhaust, despite any amount of muffler spray. But the "dinky" took more than her just share of engine-hours, saving the mains for the pinches.

Diving was an instantaneous evolution, necessarily accomplished mostly by reflex upon sounding of the alarm. A running dive is the submarine's foremost weapon and defense. On the first blast of the Klaxon, the throttlemen were in action. "Trip" the engine, open the test-cocks, close the outboard exhaust. The diving station holds the main induction open until indicator lights show all engine outboard exhausts closed, preventing burning of compartment air. The induction must be closed before the sea immerses the baffling, however; consequently, alert throttlemen are necessary. The *Squalus* was sunk by water pouring in through a main induction which, as the dive progressed, could not be closed.

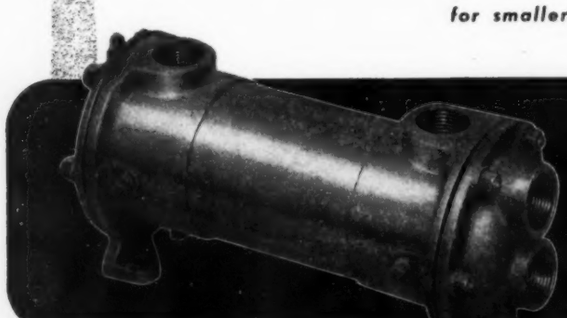
Following this, the throttlemen secure the inboard exhausts, the hull flapper in the engine air induction, and the circulating water. The forward engine rooms must also shift the hull ventilation to "recirculate," while the auxiliaryman secures any air charge. The entire operation must takes less than one minute.

Surfacing procedure must be similarly quick for, driving to a battle surface, the instant pressing of attack is the prerequisite for laying the guns. The moment the captain orders the main induction opened, the engines must be ready for firing at peak load. To leave propulsion at "surface-turns," considerably greater than the submerged speed schedule, on the batteries would in a matter of minutes "shoot the can."

The essence of maintenance while on patrol is sensible use of the Diesels. In the area, an engine out of commission for any length of time constitutes a hazard to all hands and, perhaps, sacrifice of an opportunity to attack. When underway maintenance was necessary, it was on

HOW A MINIMUM QUANTITY OF WATER PRODUCES MAXIMUM COOLING EFFICIENCY

for smaller Diesel engines



ROSS

A high rate of heat transfer for lube oil and jacket water cooling can be accomplished with small quantities of cooling water. Users of Ross "BCF" Coolers for smaller Diesels know this.

The high water velocity through the tubes, characteristic of the "BCF" design, produces maximum heat transfer rate and best performance from any given quantity of water. Minimum cooling water, therefore, is required for any specific operating condition.

FREE CATALOG

For complete design details on compact, sturdy, adaptable "BCF" Coolers, write for Bulletin 4922.

ROSS HEATER & MFG. CO., INC.

Division of American Radiator & Standard Sanitary Corporation

1425 WEST AVE. BUFFALO 13, N. Y.

ROSS EQUIPMENT IS MANUFACTURED AND SOLD IN CANADA BY HORTON STEEL WORKS LTD., FORT ERIE, ONTARIO

a "repair as it fails" basis. Typically, it consisted of inserting a spare injector occasionally, or hunting down a fuel leak! The progressive maintenance program was handled during the inter-patrol refits at advanced bases. Overhaul of the engines was done at the end of six patrols, constituting a period of some fifteen months, in a Navy Yard.

For this program, submarine tenders dotted the Pacific Islands to provide the needed shops and expert personnel. And to each tender or base were assigned several "relief crews," representing the complete complement of a submarine, but devoted solely to the refit or overhaul of one boat after another. While the "relief crews" and tenders accomplished the maintenance program from stem to stern, the regular ship's company was sent to "Submarine Recuperation Centers." Replacement personnel were taken from the relief crew, and a system of rotation established. Minor alterations were also accomplished during refit. Major alterations were left until the overhaul period, at which time the "hard-patches" over the engine spaces could be removed and easy access had to the units.

Major casualties to the engines were few, usually attributable to delinquent personnel. One submarine effectively fused an engine, part to part, when a throttleman, anticipating an idyllic watch, cut out the lube oil alarm to stop its raucous warning. It is true that the Destruction Bill recommends stoppage of the lube oil supply as the surest means of engine disintegration.

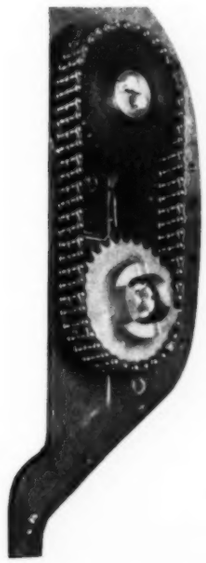
Sun Oil Company Issues Informative Diesel Bulletin

THE Sun Oil Company has recently published a bulletin entitled *Lubrication of Diesel Engines* which should prove to be of great value as a handy reference for Diesel facts. Beginning with a history of the Diesel engine and ending with a handy trouble shooting chart, the bulletin is filled with valuable information covering fuel injection, combustion, lubrication, and oil filtration. The bulletin is of special interest to newcomers to the Diesel field as it brings forth clearly the basic theory of Diesel operation with its efficiency and fuel economy.

The characteristics of various types of lubricating oil are discussed along with advice concerning their proper use. A temperature-viscosity chart for the proper selection of lubricating oils is included.

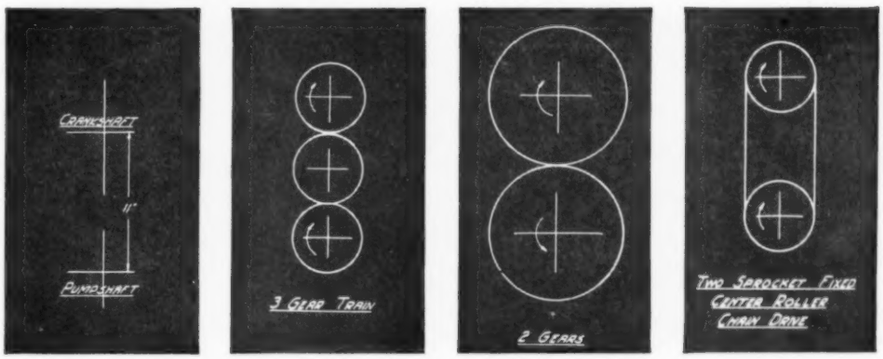
The bulletin may be had by requesting Technical Bulletin Number B-1 (Revised), Sun Oil Company, Philadelphia 3, Pa.

No. 3* of the Diamond Diesel Drive Dozen



LUBE OIL PUMP DRIVES

Diamond Roller Chain Is Simplest



Shaft Location

3-Gear Train 3 Shafts

2 Gears Too Large

Diamond Chain Drive—2 shafts—simple, adaptable.

A glance at the above diagrams shows the simplicity of a Diamond Roller Chain Drive. Distance between shafts means nothing to a chain drive—space required can be kept to a minimum—load is distributed over many sprocket teeth—as efficient and noise-free after long service as when installed.

Diamond Roller Chains are used by 32 engine builders—Diamond has developed the engineering technique and the special precision manufacturing facilities to insure the uniformity of quality and reserve strength required for long life performance. . . . No engine builder who has ever adopted Diamond Drives has ever supplanted them. Practical engineering assistance is yours for the asking . . . DIAMOND CHAIN COMPANY, Inc., Dept. 407, 402 Kentucky Avenue, Indianapolis 7, Indiana. Offices and Distributors in All Principal Cities.

OTHERS OF THE DIAMOND DIESEL DRIVE DOZEN

1. Camshaft Timing Drives
2. Fuel Injection Pump Drive
3. *(See illustration above)
4. Fuel Supply Pump Drive
5. Water Pump Drive, Fresh and Salt Water
6. Generator Drive
7. Exciter Drive
8. Governor Drive
9. Air Compressor Drive
10. Tachometer Drive
11. Supercharging Blower Drive
12. Power Take-off Drive and Marine

Diamond Engineers Know How to Put a Chain Drive on an Engine

To save your time, forward your blue prints—or write for Chain Drive Data—Catalog 595.

DIAMOND ROLLER CHAINS

John S. Barnes Corp. Appoints New York Representative

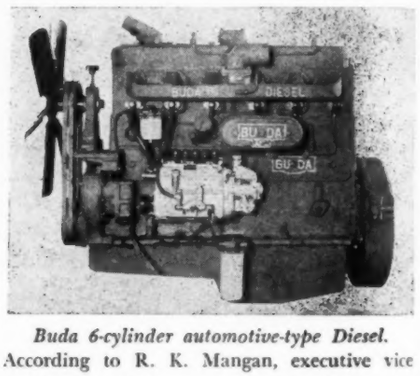
THE John S. Barnes Corporation, widely known manufacturers of hydraulic equipment, has announced the appointment of the George M. Pearse Company, 965 Broad Street, Newark 2, New Jersey, as its sales representative in the metropolitan New York and Newark territory. Under the new arrangement, hydraulic sales in this territory will be under the direct supervision of R. G. Pearse, a hydraulic engineer of wide experience. Mr. Pearse may be reached by mail at the above address or by telephone at Mitchell 2-0267. Announcement is also made by the John S. Barnes Corporation that Ernest C. Hawkins, for several years manager of the company branch sales office in Newark, will be transferred to the newly created Chicago office. Details regarding the opening of the Chicago office will be made public at a later date.

Kerkling & Company Appoints Eastern Manager

KERKLING & Company announces appointment of George L. Bauer as Eastern Division Manager for the Kerkling Industrial Division located in Chicago under the direction of A. B. Tincher, Industrial Manager. Mr. Bauer enters the Kerkling organization with a 14 year background of automotive manufacturing and engineering. Chicago offices for the Industrial Division were established last year to meet the demand for application of Kerkling's new K & W Method for reclaiming porous castings which cuts production costs through their processing of castings that otherwise would be rejected because of porosity. This eastern expansion is expected to further the application of this new process.

Buda to Return to Building Truck Diesels

THE Buda Company, one of the original builders of Diesel engines for trucks before the war, now intends to return to this field through the construction of much larger engines and an expansion to include foreign markets, it recently announced.



Buda 6-cylinder automotive-type Diesel.

According to R. K. Mangan, executive vice president of Buda, a large number of new machine tools and plant equipment have been installed to produce a new series of truck engines (known as the 844 series). This will enable the company to lower manufacturing costs and produce the highest quality of product, he said. He pointed out that in many foreign countries there is a demand for Diesel engines in motor trucks and that more and more United States exporters of trucks are endeavoring to meet this demand.

Buda originally began building small truck engines in 1924, but just before World War II, a survey indicated that greater loads at high average speeds would soon be required. In 1939, 150 hp. was the maximum available. Design work on the new series, to be built in six and eight cylinder sizes was done in 1939 and 1940. Mr. Mangan pointed out that these are natural aspirated Diesels as well as supercharged types. The six cylinder engines will develop 180 to 225 hp. and the eight cylinder, 240 to 300 hp., he said.

BUCKEYE DIESELS

MARINE-STATIONARY

DAY following NIGHT is always DEPENDABLE.

It's the same kind of DEPENDABILITY that has faithfully served owners of Buckeye engines ever since 1908.

When you install a Buckeye Diesel you make a profit-wise investment in LOW COST, EFFICIENT POWER which is the result of more than 38 years of proved engineering ability and manufacturing skill devoted exclusively to the building of marine and stationary engines.

Stationary and Marine Propulsion (Direct Reversing) Engines 150-1400 H.P.

Marine Auxiliary and Stationary Generator Sets 100-1000 KW.

"Be Profit-Wise and Dieselize with Buckeyes"

THE BUCKEYE MACHINE COMPANY, LIMA, OHIO

• ENGINE BUILDERS SINCE 1908 •

Howard Oxsen Becomes Seattle Branch Manager For Fairbanks-Morse

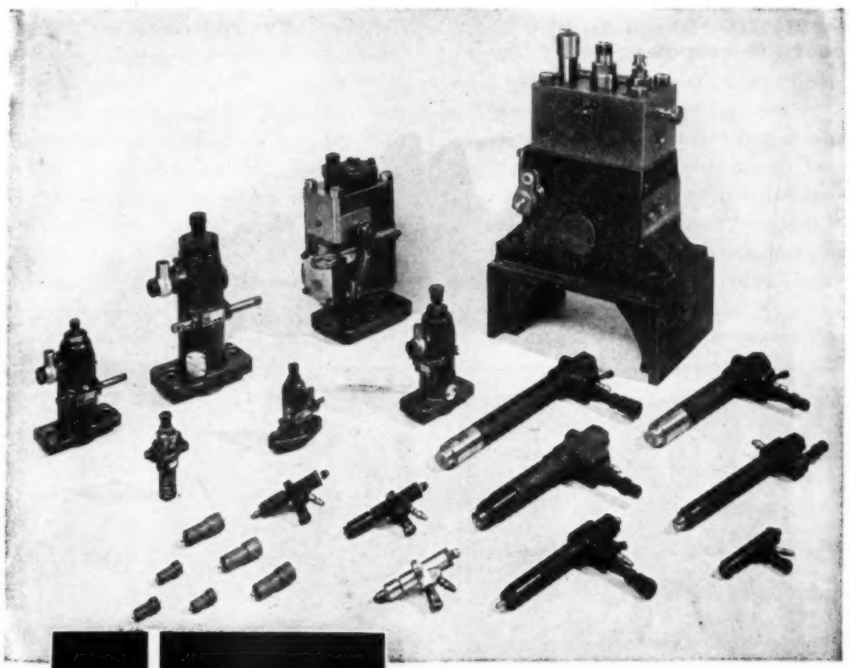
HOWARD OXSEN has been promoted to manager of the Seattle branch house of Fairbanks, Morse & Co., according to the recent announcement by R. H. Morse, Jr., Vice President and General Sales Manager. He succeeds John F. Marquitz who will be assigned new duties.

Howard Oxsen

"Howard," as he is well known on the West Coast is a "quarter-century" man with the company, having first joined the Fairbanks-Morse organization in San Francisco in early 1917 in the repair parts department. Hard work, studies in night school and stick-to-it-iveness brought him constant promotion—first to field service man, then field engineer and later Diesel engine department manager of the San Francisco branch from 1938 to 1945. During the past few months he underwent a period of training for his new assignment, in which his many friends, customers and business associates wish him the best of success.

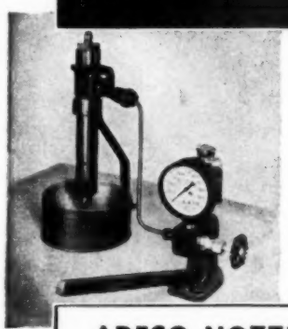
Hovey Petroleum Elects Gholson Vice President

AUBREY T. GHOLSON, sales manager for Hovey Petroleum, Houston, was recently elected vice-president of the company, Dan Hovey, President, has announced. Gholson joined Hovey Petroleum Company immediately after he was discharged from the Army in September, 1945. During that time he has been manager of sales. Recently import and export sales have been greatly expanded and the company now has representatives in South America and Mexico. Gholson entered the oil and oil export business in 1925. He was associated with petroleum inspectors before he entered military service.



adeco...

YOUR SOURCE FOR DEPENDABLE FUEL INJECTION EQUIPMENT



Whether you need standard fuel injection equipment or special units built to your specifications, Adeco offers the logical source of supply.

Today's line of Adeco equipment, the outgrowth of long experience in serving the Diesel industry, includes: Standard fuel injection pumps in plunger diameters from 7 mm. to 31 mm.; a complete line of standard nozzles and nozzle holders, including the water-cooled type; and the Adeco nozzle tester.

All Adeco products are built to highest standards, with years of trouble-free operation behind them to testify to their reliability.

ADECO NOZZLE TESTER

For Low-Cost Maintenance

America's most widely used nozzle tester enables any mechanic to make quick, accurate tests on injector opening pressure, spray pattern, etc., and detect stuck needle valves and leakage around valve seats. Compact, portable, sturdy, precision-built. Pressures up to 10,000 p.s.i. Tests both large and small injectors on bench or engine. Prevents costly delays and possible damage to engine. Standard or Navy-approved gauge. Ideal for testing hydraulic equipment. Write for bulletin.

ADECO

AIRCRAFT & DIESEL EQUIPMENT CORP.

4401 NO. RAVENSWOOD AVE. • CHICAGO 40, ILLINOIS

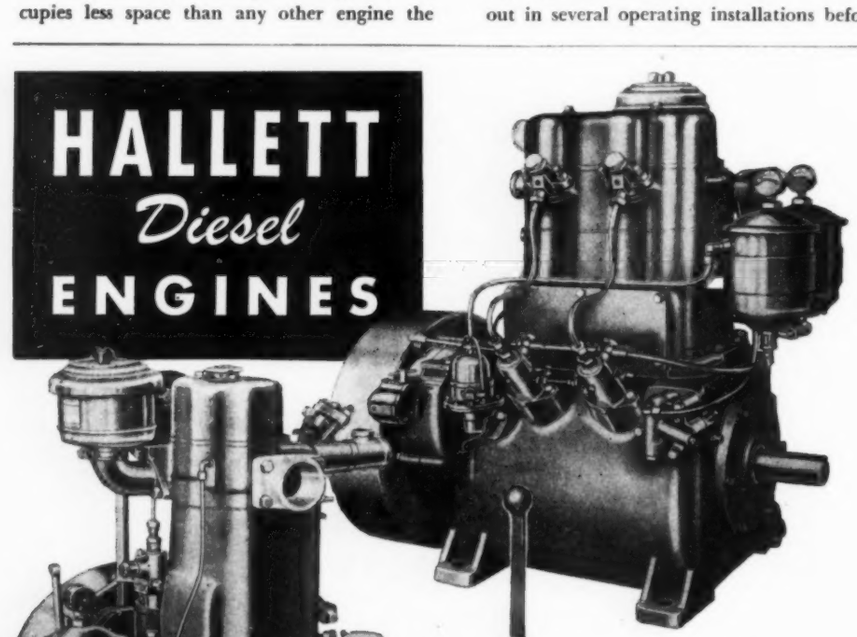
New Mystery Diesel Attains Record Horsepower

A NEW railroad locomotive Diesel now under test by the engineering department of The Cooper-Bessemer Corporation has already delivered from 40 to 50 per cent more horsepower than any other engine ever made by the company having similar displacement, Fletcher M. Devin, manager of the company's Railway Engine division, has disclosed. The new engine weighs less per horsepower, occupies less space than any other engine the company has so far produced and promises to afford outstanding fuel economy.

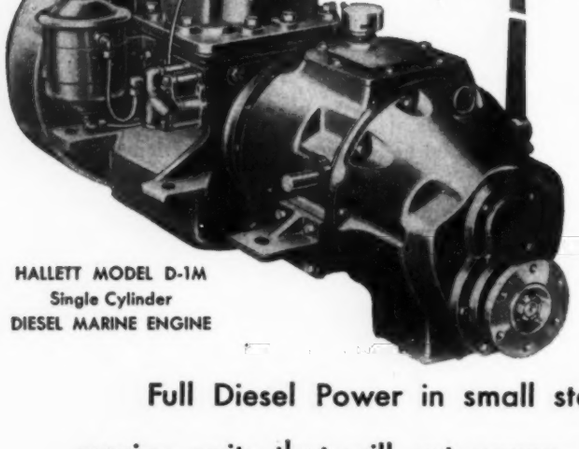
Mr. Devin said the company has been able to retain the use of its standard Meehanite metal construction and still produce an engine of remarkably low weight ratio, which will reflect itself on overall unit cost. He refused, however, to disclose further details of the new engine except to say that it will remain on test for several months and then will be tried out in several operating installations before it will be rated and sold to the general railroad and industrial markets.

Additional fundamental changes in Diesel engine design practice may also be incorporated later as the result of a detail study of captured German submarine engines which the company's engineering department now has under way, he declared. These changes will probably embody the simplification and further improvements in design. The increased horsepower and other record-breaking achievements so far, are partially attributable to new developments in the field of supercharging.

HALLETT *Diesel* ENGINES



HALLETT MODEL D-2
Two Cylinder
DIESEL STATIONARY ENGINE



HALLETT MODEL D-1M
Single Cylinder
DIESEL MARINE ENGINE

Full Diesel Power in small stationary and marine units that will cut power, lighting and overall operating costs in all classes of service.

Single Cylinder		Two Cylinder
8	Horsepower	18
50	Cu. In. Displacement	100

Fuel: 44°— 28° A.P.I., average 32°. Speed Range: 600-1800 r.p.m.

Write for bulletin stating type and size engine required.

HALLETT MANUFACTURING COMPANY

New York Detroit INGLEWOOD, CALIFORNIA. U.S.A. Glendale

Cable Address: HALMFG. Established 1916 Code: Bentley's

Nationwide Directory For Cracked Engine Block and Head Repairs

THE highway vehicle operator who has experienced a cracked engine block or head hundreds of miles from his terminal will be the most appreciative one to receive a copy of "Where To Go For Repairs on Cracked Engine Blocks and Heads" now being issued by Kerkling & Company.

This 52 page booklet lists over 2500 K & W distributors throughout the United States and Canada. Because of the valuable information contained, including a digest of an O. D. T. report on repairing cracked engines and blocks, this booklet is an essential item in the tool kit of every cross-country vehicle. Copies may be obtained by writing Kerkling & Company, 1765 North San Fernando Road, Burbank, California.

Portable Pyrometer Bulletin

A NEW bulletin describes Wheelco's complete line of portable pyrometers. Handsome walnut carrying case models for single and double scales are available with or without multiple rotary switches. Full information pertaining to the new Extension Type Lance Pyrometer and the Model 2863 Portable Pyrometer Kit is to be found pictorially illustrated.

Specifications for the proper selection of extension holders, adapters and thermocouple tips are listed in chart form. Bulletin D602-4 will be sent upon written request to Wheelco Instruments Company, 847 W. Harrison Street, Chicago 7, Illinois.

Industries Are Asked To Assist Scrap Movement

AN appeal to all industries for their immediate help toward relieving the acue shortage of iron and steel scrap is being made by the Committee on Iron and Steel Scrap of the American Iron and Steel Institute.

In order to maintain high production levels, the steel industry sorely needs every bit of scrap it can obtain, the Committee advises. Stockpiles at steel mills are low through a combination of circumstances, including the crippling effect of strikes upon industrial operations early this year.

"Every company which is waiting for steel—whether it be sheets or bars for fabrication, rails or pipe to be laid, a new machine for production, a motor truck or even wire for tying packages—can help increase steel output by promptly assisting the movement of scrap."

Both production scrap and dormant scrap are needed. The latter includes obsolete machinery tools, equipment, jigs, dies, fixtures and so forth, which are incapable of current or immediate future use because they are broken, worn out, irrepairable, dismantled or in need of unavailable parts necessary to practical reemployment.

Industrial plants, railroads, mines, utilities, shipyards and other businesses can influence the scrap supply picture to a considerable extent, said the Committee, pointing out that during the war it was demonstrated that surprisingly large amounts of vital material and equipment could be cleaned out as scrap.

Companies desirous of starting at once to gather up scrap, thereby indirectly helping themselves to get more new steel, are urged by the Committee to organize the task by appointing a top executive with authority to make decisions, to set up a salvage committee which in cooperation with company officials and employees will speed up the flow of scrap that is generated in the normal process of manufacturing, and survey company plants and other properties for untapped sources of dormant scrap.

Wherever possible, scrap should be separated by types, putting iron scrap together in one place and steel scrap together in another spot. The material then can be moved promptly through the company's regular scrap dealers. Soon the worn-out, obsolete or otherwise useless iron and steel articles will be moved to a steel mill, cut up and charged into furnaces.

RED INDEX shows the highest or lowest temperature reached!

Simply swing the red index to the low side of the temperature pointer, and the index will move to the *lowest temperature reached*, and *remain there* until manually reset. For *highest temperature* record, simply swing the red index around to the high side of the pointer.

The index movement in no way impairs the guaranteed high accuracy of the WESTON Thermometer.

Thus the WESTON Maximum-Minimum Thermometer provides, at only slightly above ordinary thermometer prices, a means of obtaining high or low temperature records on equipment or processes where these extreme temperatures are critical. Ideal for transformers, sterilizers, ovens, chemical equipment, food processing, etc. For complete information, consult your nearest WESTON representative.

WESTON ELECTRICAL INSTRUMENT CORPORATION
617 Frelinghuysen Avenue, Newark 5, New Jersey

Texaco Announces New Oil For Marine Service

DEVELOPMENT of a complete new line of marine lubricants, designed to improve the performance of pleasure craft inboard engines, both gasoline and Diesel, at reduced operating and maintenance costs, was announced recently by The Texas Company. Known as Texaco Marine Motor Oils SAE 10, 20, 30, 40, and 50, these five new products are heavy-duty detergent type lubricants.

These new oils are manufactured by careful refining from selected crude sources. The additive compound is then incorporated, providing several important characteristics not obtained in straight mineral oils alone. The result is a lubricant which keeps new engines clean and provides a cleansing or dissolving action which reduces or removes previously formed deposits from used engines. In addition to this cleansing action, the chemicals keep the finely divided particles resulting from fuel combustion and oil decomposition suspended in the oil so that they do not settle out in the engine but are removed at regular oil-change periods. By promoting engine cleanliness, the new oils eliminate sticking of piston rings which causes scored cylinders or liners and wear on cylinders and rings.

Fairbanks, Morse & Co. Add to Railroad Division Personnel

FAIRBANKS, Morse & Co. has taken steps to expand the activities of its Railroad Division throughout the country, according to R. H. Morse, Jr., Vice President and General Sales Manager of the company, who announces the following additions to the organization of the Railroad Division:

E. A. Foster

E. A. Foster has been appointed Manager of the Application Engineering Department of the Railroad Division with headquarters in Chicago. He will have direct responsibilities for all locomotive application studies. Mr. Foster was formerly with the Electro-Motive Division of General Motors Corporation, where for the past ten years he was connected with various departments of that organization.

Jack Weiffenbach

J. F. Weiffenbach has been appointed Chief Engineer of the Railroad Division, also with headquarters in Chicago. Mr. Weiffenbach is a graduate of the University of Michigan with a degree in Mechanical Engineering. He joined the Electro-Motive Division in 1934 and has had wide experience with performance and application of locomotives in service.

Frank Ross, Jr.

Frank Ross, Jr., who has been Assistant in the Railroad Division for the past year, has now been appointed Sales Engineer in charge of locomotive sales in the St. Louis area. Mr. Ross will be located at St. Louis where he has many friends and acquaintances having at one

Soon...

"Custom-built" QUALITY generators

in QUANTITIES to meet your needs

For years Fidelity has been building fine generators—with a meticulous care that is usually associated with the words "custom built." Production was low, partly because Fidelity wouldn't hurry a job at the expense of quality but, to a greater degree, because of limited and antiquated plant facilities and methods.

Some months ago we began a program of plant modernization and methods management which will materially increase the availability of Fidelity generators. Not to the point where they will be easy to get (we do not expect to turn them out on a production line basis—or want to—ever) but we will have manufacturing facilities which will enable us to take on a few new customers, and still keep our promises to the old ones who have been buying generators from us for years.

If you are interested in this kind of a source of supply for generators, we suggest that you start discussion now, before our improved production facilities have been committed.

Fidelity AC Generator of the type being supplied to Diesel and gasoline generating unit manufacturers. Our engineers and draftsmen will, of course, assist in integrating mounting, power take-off, etc., with your engine design.

Fidelity AC Generator with exciter and end bell removed to show collector rings, commutator, end of armature and exciter field coils. Observe that the collector rings, exciter and commutator are really accessible for servicing and inspection.

Installs Zanderoll Process

To put production on a better basis and further improve Fidelity quality, the Zanderoll process of applying insulating varnish to armatures and stators has recently been installed. This is merely indicative of the scope and direction of Fidelity's plant modernization program.

FIDELITY ELECTRIC COMPANY, INC.

330 North Arch St., Lancaster, Pa.

Fidelity ELECTRIC GENERATORS

time been with the Terminal Railroad Association of that city, where he had charge of Diesel Locomotive Operation and Maintenance.

Frank M. Bosart

Frank M. Bosart has been appointed Eastern Manager of Locomotive Sales and will be located in the company's New York Branch. Mr. Bosart comes to Fairbanks, Morse & Co. from the Electro-Motive Division of General Motors, having had ten years' service with that division in various capacities in both the service and sales departments.

Robert Aldag, Jr.

Robert Aldag, Jr., has been appointed Sales Engineer in the Chicago district with headquarters in the Chicago office. Mr. Aldag is a graduate of Purdue University where he specialized in Railway Mechanical Engineering. He started with the Erie Railroad and later joined the Chicago, Burlington and Quincy Railroad Company where his duties these past six years had to do with the operation and maintenance of Diesel locomotives.

11th Edition of the Diesel Engine Catalog Just Off the Press

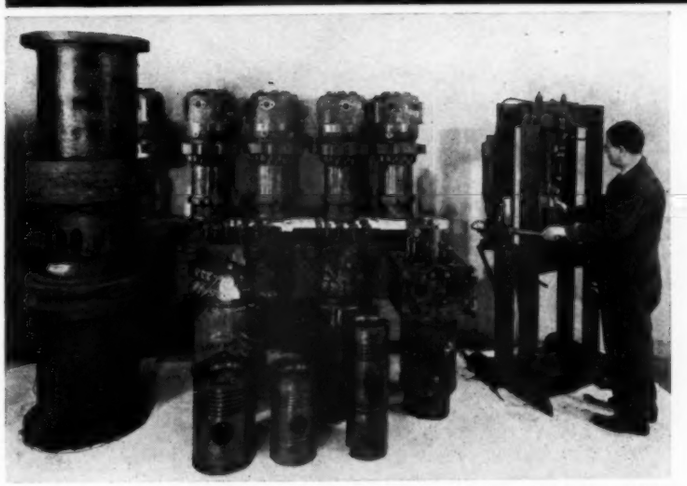
A NEW, completely revised edition of the DIESEL ENGINE CATALOG just came off the press and is now available. This—the first post-war edition of the Catalog reflects sweeping changes in engines and Diesel plant equipment, with many new engine models added. Each engine builder's line is described in detail and illustrated—fuel, lube and cooling systems are traced in color. Over 500 pages packed with valuable information—four sections including the Diesel Engine section, Accessory section, The Market Place—a directory of engines and accessories, and an advertising section. The Catalog embodies the entire Diesel industry under one cover—an indispensable book for design, operating and consulting engineers, sales executives and sales engineers, schools, libraries, in fact for all interested in Diesels. First printing limited so order your copy today. Price $10.00. Use the convenient order coupon on page 107 of this issue of DIESEL PROGRESS.

H. W. RAMBERG, Inc.

SHIP REPAIRING

37 VAN DYKE ST BROOKLYN, N. Y

SHOP PHONES CUMBERLAND 6 {3960 {3961



DIESEL

Overhauling, Repairing, and Redelivering.

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Foreign and Domestic Pistons, Liners, Cylinders, Covers, Valves, etc.

PIONEERS IN DIESEL REPAIR WORK SINCE 1919

LET US SOLVE YOUR DIESEL PROBLEMS

Fabricators and Reconditioners of both Domestic and Foreign makes.

• • •

Fuel Valves, Pumps, Valve Plungers, and Housings.

• • •

Cams and Rollers, Oil Filters, Gears, Injectors, Atomizers and Nozzles.

• • •

Telescope Pipes, Governors, Pistons and Lubricators.

• • •

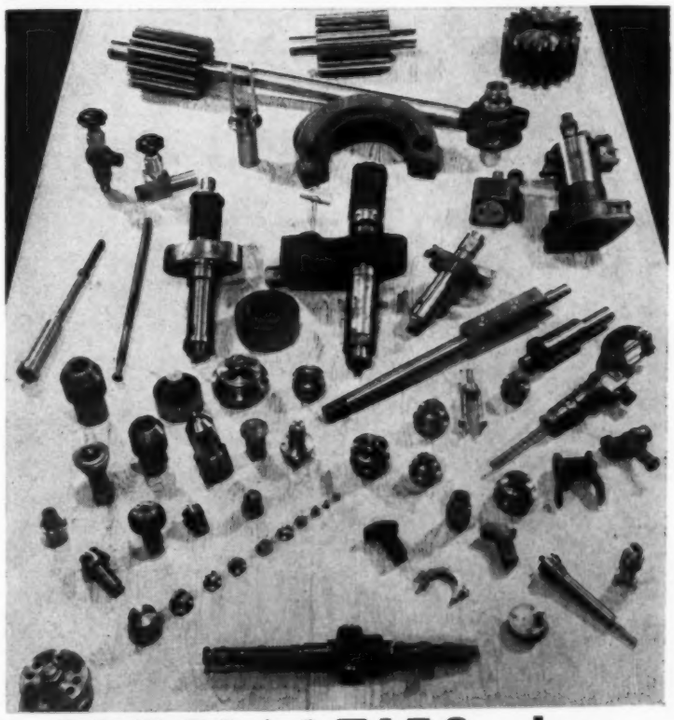
H.P., M.P., and L.P. Compressor Valves, Cylinders, Pistons.

• • •

Slide, Exhaust, Inlet and Starting Valves.

• • •

Inlet and Exhaust Spindles.



DIESEL SPECIALTIES, Inc.

2 VAN DYKE ST. TELEPHONE: CUMBERLAND 6-3965 BROOKLYN, N. Y.

New Engineering Service for Piping Layouts

PIPING layout design is a new service inaugurated by the Engineering Department of Pennsylvania Flexible Metallic Tubing Company of Philadelphia.

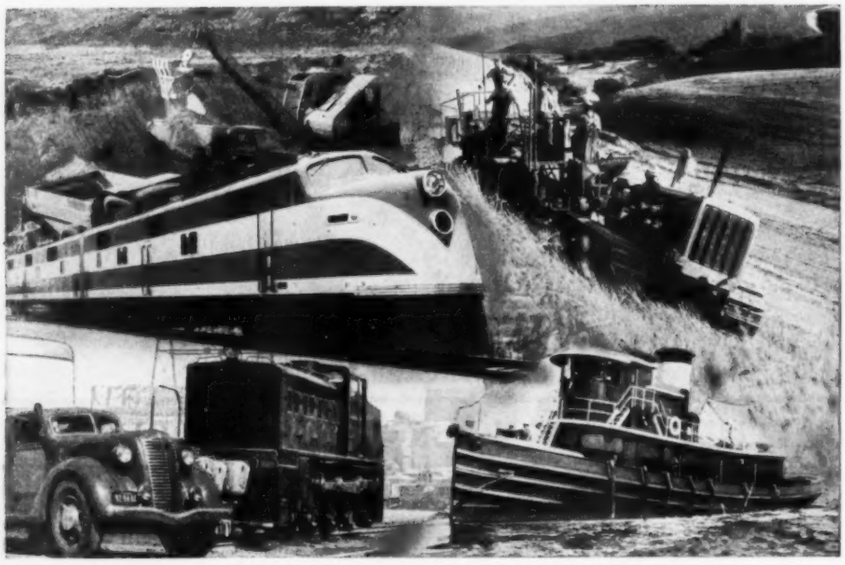
This innovation was first tried out in answer to an apparent need. It met with such a welcome—especially from manufacturers and constructors whose engineering staffs were shorthanded or who felt the need for specialized experience—that it was decided to make it a new departmental service.

It includes, besides problems in piping layout, those involving absorption of line vibration, flexible connections, special fittings, the handling of pressure pulsations, changes in temperatures, water and air jacketing.

New Diesel Booklet for Schools

THE pocket-size booklet "What Do G.M. Diesels Do?" was written in verse form and illustrated by Jim Brown, Product News Manager of the Detroit Diesel Engine Division of General Motors. It describes the role that compact, high-speed Diesels play in the every-day lives of all of us, and illustrates about 40 of these applications. Diesel engine applications were limited to electric power generation, stream-lined trains and large boats a few years ago, but they now play a vital part in development of hitherto inaccessible natural resources. Few people realize how extensive and important this development is. The booklet, written for Mr. Brown's young son, should receive considerable acceptance as collateral reading for school children as well as for adults. Copies are available free by addressing Detroit Diesel Engine Division, General Motors Corporation, Detroit 23, Michigan.

PROVED IN THE FIELD



MICHIANA FILTERS

MICHIANA Filters have been rigidly tested and proved on all types of essential equipment including marine craft and military motorized units; in stationary plants—on trucks, farm and construction machinery—on streamliners, freight and switcher locomotives. Performance checks demonstrate that they more than meet all practical field conditions for efficient filtering, durability, and servicing economy.

Engines stay clean for many extra miles of lower cost operation when MICHIANA Filters are installed. Engine life is lengthened, oil consumption cut, and maintenance costs are reduced. You will find a MICHIANA Filter of the correct size and type for any engine, gas or Diesel—up to several thousand horsepower. Use the oil filter built on experience—MICHIANA.

Bulletins 839 and 45-D describe filters for gasoline and Diesel engines respectively—Send for copies today.

MICHIANA OIL FILTERS

MICHIANA PRODUCTS CORPORATION
Michigan City, Indiana

B. V. E. Nordberg

THE Nordberg Manufacturing Co. announced recently that B. V. E. Nordberg, son of the late Dr. Bruno V. Nordberg, founder of the comapny, died August 19, at the age of 62. Mr. Nordberg was born in Milwaukee, educated in the public schools and graduated from the University of Wisconsin in 1907. Following graduation he became an employee of the Nordberg Manufacturing Company serving in various capacities, and since 1923 had been Executive Engineer.

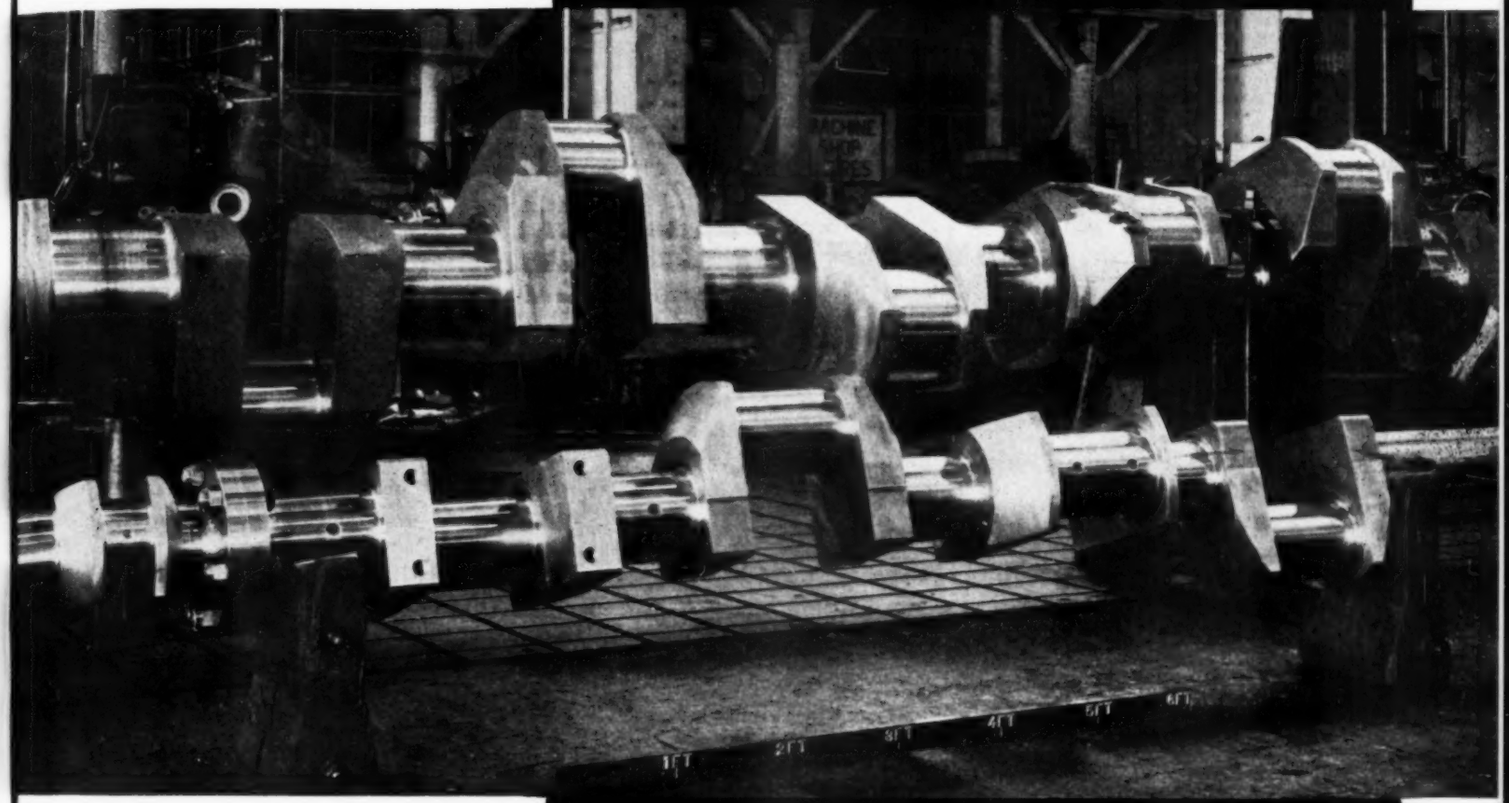
Mr. Nordberg took an active interest in various engineering groups, and was a member of the following professional and engineering organizations; Society of Automotive Engineers, Society of Naval Architects and Marine Engineers, American Society of Mechanical Engineers, and many others.

At the time of his death he was Vice Chairman of the Milwaukee Sewerage Commission, having been a member of that Commission since 1926. He was also Vice Chairman of the Wisconsin Registration Board of Architects and Engineers.

George Rea Named Perfect Circle Secretary-Treasurer

IN their recent meeting, the Board of Directors of The Perfect Circle Company elected George T. Rea to succeed the late Leslie B. Davis as Secretary-Treasurer of the corporation. Mr. Rea joined the company as Cost Accountant and Paymaster in 1931. In 1934 he was appointed Inventory Manager of the Sales Division and in 1942 he became company Controller, which position he held until assuming his new duties.

Shafting for—



Whether it be shafting for large or small Diesels, Erie has the know-how, based on long experience, and the equipment to control every step in manufacture. The basic problems are the same—they dictate meticulous care and control from raw material to finished shaft—that is why Erie excels.

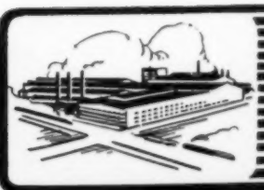
Note: Erie Forge shops are today finishing largest Diesel shafts to the extremely close tolerances that were formerly required on small shafting.

AMERICA'S DIESELS

Large or Small

ERIE FORGE COMPANY, ERIE, PA.

★ ★ ★ ★ ★ ★ ★ ★ ★



Cummins Engineer Discusses Diesel Truck Applications

Editor's Note: This discussion is taken from a talk given by John Watts, Application Engineer of the Cummins Engine Co. before the Cincinnati Section of the SAE.

WITH the trend more and more to "balanced" trucks, it is interesting to speculate on the complexities of supplying Diesel engines with all the various accessories necessary to meet the diversified requirements of heavy-duty truck manufacturers and users.

Only something like 1 per cent of the Cummins Diesels sold go out built according to a particular specification. Since January 1, 1944, our Specification Department has written up 2800 different specifications. In general, variations in specifications are brought about by consideration of items such as oil pans which fall into two general classifications of front and rear sump, or starter locations to avoid interference with other accessories. In certain cases of extreme angular operation, such as in dirt moving equipment, arrangements must be made which will prevent lack of lubricating oil at the pickup point of the lubricating oil pump.

In working out the Cummins Diesel for a particular "balanced" truck, many different type of problems are encountered. We again are doing a lot of work with rubber mountings. Due to frame weave it is necessary to provide some freedom of movement for the engine or run the risk of ruptures in some part of the supporting system. Our work so far indicates that almost complete elimination of vibration can be obtained, but that a compromise must be drawn between mounting life and flexibility. Our experience with rubber mountings brings to mind another design problem which is receiving consideration, and from our point of view should receive even more. This has to do with the location of the rear engine support. With engine horsepower requirements increasing, transmission requirements and weights have also gone up. This has materially increased the bending moment on the flywheel housing. On our new line of engines we have designed the oil pan so that it will give additional support to the flywheel housing. The best approach is to locate the rear engine support on the clutch housing at such a point that the bending moment is zero at the point of attaching the flywheel housing to the engine.

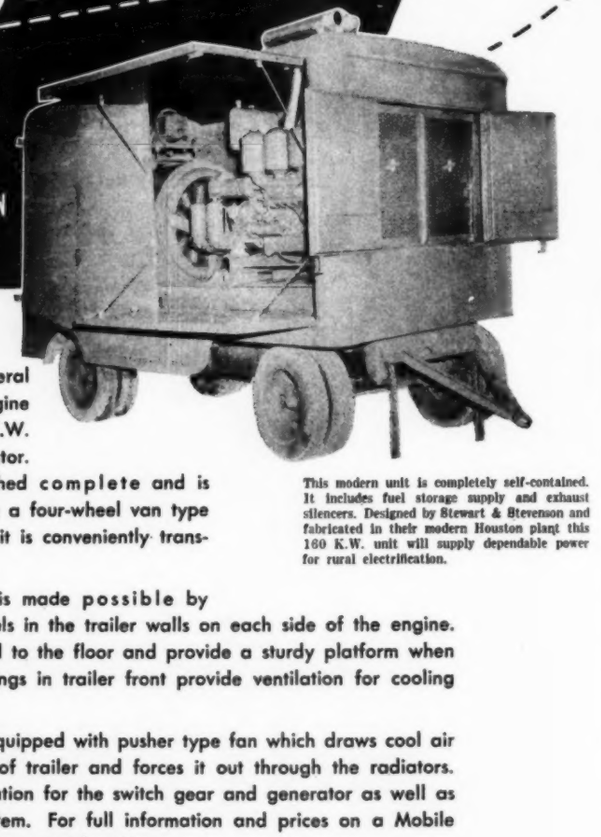
More and more use is being made of hydraulic steering aids which require a hydraulic pump. In some cases, this pump can be located directly in front of the engine and direct connected to the crankshaft. In other cases, the pump is located alongside of the engine and driven by belts from a pulley mounted on a shaft extended through the timing gear cover and driven from the gear train.

The location of the air cleaner and lubricating oil filter requires consideration. We select or authorize the use of an air cleaner of proper size to give high efficiency with a minimum of air restriction and large enough to prevent oil being drawn out of the cleaner into the engine. All of this work can easily be nullified by using too small a connection between the cleaner and the engine or poorly considered bends that increase restriction, or one too small for higher altitudes. Another unnecessary power loss is brought about by the fact that on many installations engine intake air is taken from directly inside the hood, where it is heated to high temperatures by the exhaust added to that gained by passing through the radiator, thereby penalizing the engine with a

160 K. W. MOBILE

Diesel Power Station

ENGINEERED AND DEVELOPED BY STEWART & STEVENSON



This modern unit is completely self-contained. It includes fuel storage supply and exhaust silencers. Designed by Stewart & Stevenson and fabricated in their modern Houston plant this 160 K.W. unit will supply dependable power for rural electrification.

● The unit consists of a General Motors Twin 6-71 Diesel engine directly connected to a 160 K.W. alternating current generator. The Power Station is furnished complete and is mounted with switch gear in a four-wheel van type custom built trailer, so that it is conveniently transported from place to place.

Easy access to the engine is made possible by specially designed side panels in the trailer walls on each side of the engine. The lower panels are hinged to the floor and provide a sturdy platform when lowered. Two hinged openings in trailer front provide ventilation for cooling radiator.

The G. M. Diesel Engine is equipped with pusher type fan which draws cool air in through the rear section of trailer and forces it out through the radiators. This insures adequate ventilation for the switch gear and generator as well as for the engine's cooling system. For full information and prices on a Mobile Diesel Power Station to suit your needs write:

STEWART & STEVENSON SERVICES

4516 Harrisburg Blvd. • Houston 11, Texas

Branches in Principal Texas Cities

Distributors: G. M. Diesel Engines . . . Hallett Diesel Engines

Fabricators: Diesel Electric Standby Generator Equipment and all types of Industrial Power Installations requiring Diesel Power.

loss of power at the rate of 1 per cent for each 10 degrees Fahrenheit. Manufacturers are now arranging, where the air cleaner is located under the hood, for taking the air from outside the hood.

Generous size exhaust and tail pipes along with mufflers having a minimum of back pressure was excessive. Experience indicates that suitable installations can be made whereby at a point of 1½ inches back of the exhaust flange, the maximum back pressure will not exceed one inch of mercury for non-supercharged engines and 1½ inches for supercharged engines.

In general, the Diesel-powered truck will give an increase of about 100 per cent in miles per gallons over the truck powered with a gasoline engine. This saving in gallons per trip, multiplied by the savings in fuel cost, becomes an important matter in truck line operation.

Several other points necessary for balanced truck operation are being skipped here because they require lengthy technical discussion. But I would like to point out that it appears underpowered vehicles are on their way out, both from public and economic considerations. In order to meet competition and keep traffic flowing, operating speeds are now in the 50 to 60 miles an hour range for merchandise transport. In order to make good average time in highly populated areas maneuverability through traffic is a "must" and this precludes the use of an underpowered truck. In fact, it is predicted that maneuverability will receive more attention than it has in the past.

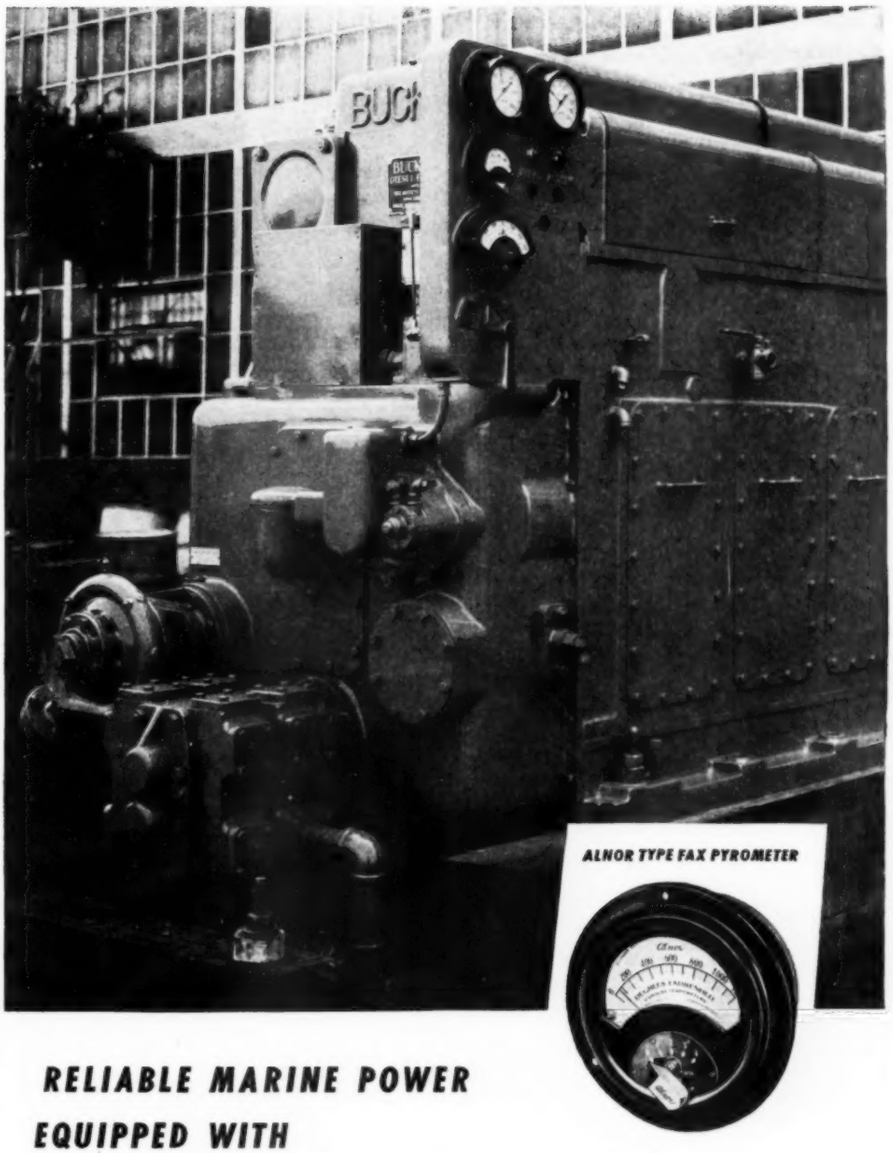
Rogers Diesel Changes Name

ROGERS Diesel and Aircraft Corporation recently changed its name to R. B. Rogers Companies, Inc. The list of Rogers companies has grown so much in the last few years and their activities expanded to such an extent that the old name no longer applies.

The Rogers group of interests includes the Indian Motorcycle Company and the Ideal Power Lawn Mower Company of Springfield, Mass.; Hill Diesel Engine Company of Lansing, Mich.; Edwards Company of Sanford, N. C.; Fox Industries of Philadelphia; Rogers International Corporation of New York, and others.

CORRECTION PLEASE

An incorrect address was given in the August issue of DIESEL PROGRESS for Poul A. Christensen, consultant for Burmeister and Wain. The correct address is 35 West 53rd Street, New York 19, N. Y.



RELIABLE MARINE POWER
EQUIPPED WITH

Alnor Exhaust Pyrometers

This six cylinder Buckeye Marine Diesel, like so many other marine engines, is equipped with an Alnor Exhaust Pyrometer, providing an easy means for keeping a routine check of exhaust temperatures. Reliable temperature readings give operators a valuable guide to efficient engine performance, correct adjustment and maintenance. There is an Alnor Pyrometer suited to the needs of any engine, large or small, afloat or ashore. Write for Diesel Pyrometer bulletin.

ILLINOIS TESTING LABORATORIES, INC.
420 NORTH LA SALLE STREET • CHICAGO 10, ILLINOIS

Recent Changes Made in International Harvester Management

MAJOR changes in both personnel and structure of the top management of International Harvester Company were announced by the company recently. The changes are a further step in the general administrative re-organization of the company which began two years ago when it adopted the divisional form of organization.

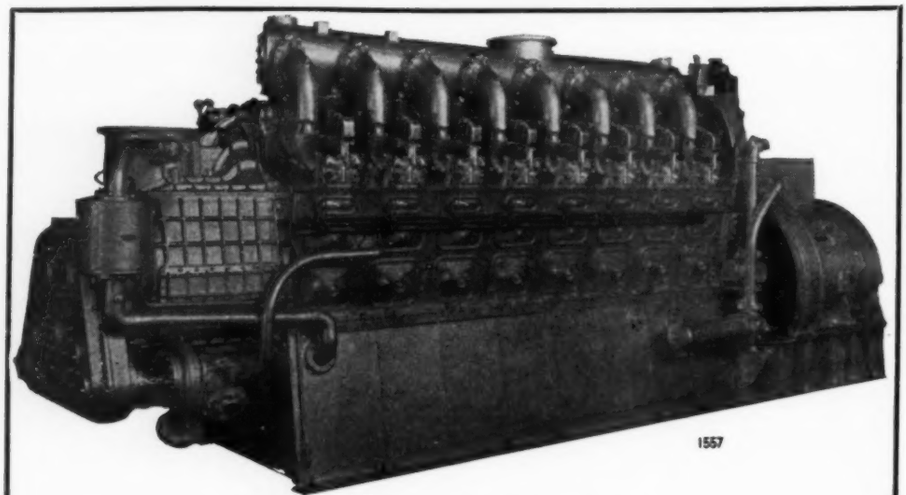
Judson F. Stone has resigned as chairman of the board of directors. He has been a director of the company for many years and will continue to serve as a director and as a member of the executive committee of the board.

Fowler McCormick, formerly president, has been elected chairman of the board. Under the new plan the chairman for the first time becomes an officer of the company.

The office of chairman of the executive committee of the board of directors is discontinued under the new plan. Sydney G. McAllister, formerly chairman of the executive committee, will continue to serve as a director and as a member of the executive committee.

John L. McCaffrey, formerly first vice president, has been elected president to succeed McCormick.

Under the new plan the president will have as his immediate assistants two executive vice presidents. W. E. Worth, formerly second vice president, and P. V. Moulder, formerly vice president in charge of the Motor Truck Division, have been elected executive vice presidents.



1600 H.P. General Motors Model 16-278-A 720/750 rpm

93,780 DIESEL HORSE POWER—IMMEDIATE SHIPMENT

MARINE DIESEL—ELECTRIC UNITS—COMPLETE—1944 GENERAL MOTORS DIESELS—ALLIS CHALMERS—WESTINGHOUSE ELECTRICAL EQUIPMENT

6400 H.P. FOUR ENGINE UNIT—TWIN SCREW
3200 H.P. TWO ENGINE UNIT—SINGLE/TWIN SCREW
1600 H.P. SINGLE ENGINE UNIT—SINGLE SCREW

ENGINES, GENERATORS PROPULSION MOTORS, CONTROLS, TAIL SHAFTS, BEARINGS, THRUSTS AND PROPELLORS.

A.C. DIESEL GENERATOR UNITS—60 CYCLE—50 CYCLE

KVA	H.P.	MAKE	RPM
2—1875	2000	FAIRBANKS	300
1—1250	1500	NELSECO	300
2—1250	1600	FAIRBANKS	720
10—1250	1600	GEN. MOTORS	720
4—1000	1200	GEN. MOTORS	600
1— 625	750	SUPERIOR	327
5— 375	450	GEN MOTORS	600
2— 375	450	ALCO (MACK)	360
1— 375	450	ENTERPRISE	450
1— 300	360	FAIRBANKS	257
5— 250	300	GEN. MOTORS	900
4— 250	400	GEN MOTORS	1200
2— 200	240	FAIRBANKS	257
1— 156	190	BUCKEYE	514
2— 127.5	165	MURPHY	1200
4— 125	150	GEN. MOTORS	1200
1— 92.5	112.5	BUCKEYE	400
10— 75	90	GEN MOTORS	1200
15— 62.5	80	INTERNATIONAL	1200
30— 37.5	60	INTERNATIONAL	1200
3— 32	45	INTERNATIONAL	1200
28— 18.75	38	INTERNATIONAL	1200

D.C. DIESEL GENERATOR UNITS—2 WIRE—3 WIRE

KW	H.P.	MAKE	RPM
12—1000	1600	GEN. MOTORS	750
2— 800	1250	McINTOSH-SEY.	250
3— 500	750	GEN. MOTORS	750
3— 300	450	GEN. MOTORS	600
1— 300	450	GEN. MOTORS	1200
6— 275	440	COOPER BESS.	800
3— 250	450	ENTERPRISE	450
4— 250	450	WORTHINGTON	450
4— 100	150	SUPERIOR	1200

SMALLER UNITS TO 10 KW

PORTABLE POWER UNITS—15 H.P. to 400 H.P. RADIATOR COOLED — WITH CLUTCH POWER TAKE OFF

WHAT ARE YOUR REQUIREMENTS?

A. G. SCHOONMAKER COMPANY

BUSINESS ESTABLISHED 1898

ENGINEERING— DIESEL ENGINES —SALES

50 CHURCH STREET • PHONE WOrth 2-0455 • NEW YORK 7, N. Y.

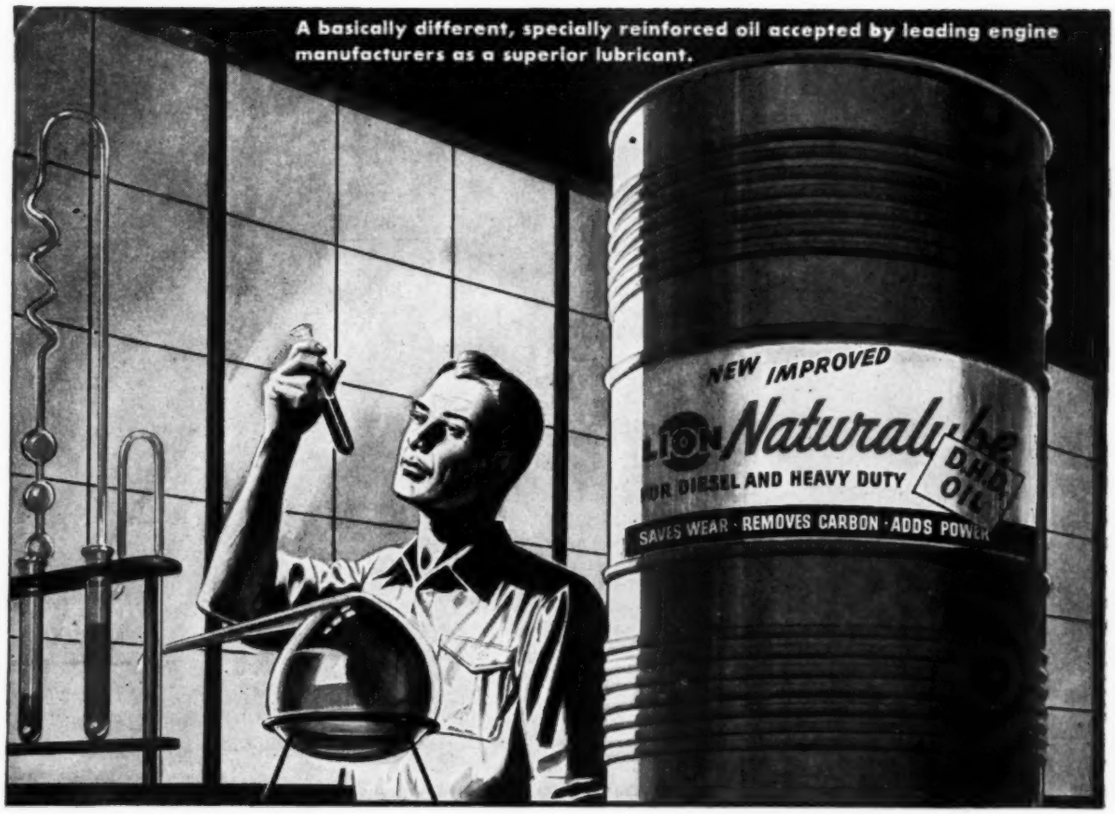
Cable Address: AGSCOMACH Shops & Warehouses, Jersey City, N. J.

Reed Vibrometer Detects Harmful Machine Vibration

THE Davey Reed Vibrometer is an instrument of vest pocket size, weighing only 5 ounces, for accurately measuring machine vibration and comparing amplitudes. Its range is from 450 to 50,000 cycles per minute. It operates on the tuned reed principle. A steel reed is fed out from the body of the instrument and when the reed comes into tune with the machine vibrations it will snap into a sharp vibration. A machine vibration of .001 in. will produce a reed vibration of approximately one half inch. Vibration frequency in cycles per minute is read directly from a graduated dial. In cases where there are several disturbing frequencies or vibrations are of complex wave form, the instrument will pick out each of the frequencies separately and evaluate its comparative amplitude.

Graver Tank Appoints E. W. Welp

THE Graver Tank & Mfg. Co., Inc., recently announced the appointment of Edward W. Welp to the position of Sales Manager of Water Conditioning Equipment. Welp, former technical director of Graver's process equipment division, has spent 32 years with the firm in every phase of research, design and construction of water conditioning equipment.


A basically different, specially reinforced oil accepted by leading engine manufacturers as a superior lubricant.
NEW IMPROVED
LION Naturalube
FOR DIESEL AND HEAVY DUTY
D.H.D. OIL
SAVES WEAR · REMOVES CARBON · ADDS POWER

RESISTS SLUDGE FORMATION
REMOVES HARD CARBON
REDUCES WEAR

Nature and science combine to make Naturalube D. H. D. the finest oil you've ever used, for special Lion processing of this basically different crude oil provides extra resistance to the formation of sludge and lacquer—the effects of heat and oxidation.

From Nature, Naturalube D.H.D. gets a tougher protective film... natural solvent properties that enable it to remove hard carbon... greater ability to *penetrate* to all moving parts of an engine and *adhere* to those parts even when engines are idle... and non-corrosiveness.

Ask your local Naturalube distributor about D. H. D. or write direct to Lion Oil Company, El Dorado, Arkansas.

For normal service, where D. H. D. is not required, use Naturalube Motor Oil (not so heavily reinforced).

Naturalube D. H. D. is supported by a positive money-back guarantee of satisfaction. If you don't believe it is the best oil you've ever used, Lion Oil Company will return your money.

LION
PETROLEUM PRODUCTS

LION OIL COMPANY EL DORADO ARKANSAS

Corrosion and Scale Control

THE current issue of H-O-H Lighthouse recognizes the Fifteenth Anniversary of D. W. Haering & Co., Inc., leaders in the field of corrosion and scale control through the use of Glucosates. In addition two interesting and informative articles acquaint the reader with several common and uncommon applications of these organic chemicals to widely diversified water-treating problems.

Write for your free copy on your company letterhead, addressing your request to D. W. Haering & Co., Inc., 205 Wacker Drive, Chicago 6, Illinois.

Metron Low Speed Tachometer

FOR direct measurement of speeds down to 10 rpm. and 1 fpm. is the new Metron low speed hand tachometer. It has three ranges which extend to 1000 rpm. It consists of two units, the head and the indicating unit. The head is not a generator. It is, in effect, a double pole, double-throw switch which is operated by the rotation of the spindle. When this spindle rotates, the switch blades oscillate, thereby charging and discharging a condensor by means of a battery in the series circuit. This permits current to flow in small charges from the battery through the milliammeter. The current is exactly proportional to the rpm. of the spindle.

The instrument is particularly useful for getting a continuous indication of low rotational or linear speeds such as found in textile food and metal processing industries. It is priced at $87.50 and comes complete with carrying case and all necessary contact tips and discs. For further information write the Metron Instrument Company, 432 Lincoln St., Denver 9, Colorado.

Nordberg Consolidates District Offices

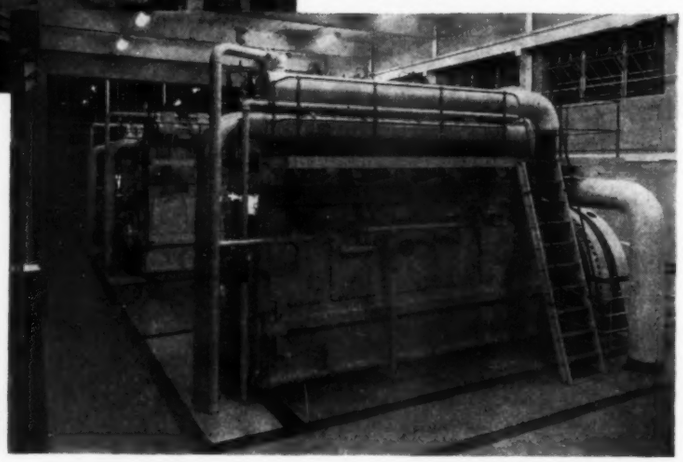
NORDBERG Manufacturing Company announces the consolidation of its Los Angeles and San Francisco offices in a new building and warehouse at 674 Harrison Street, San Francisco. This new building is of reinforced concrete with 73 ft. frontage and 100 ft. depth, located within walking distance of the principal business district and waterfront of San Francisco. These new and expanded facilities take the place of offices formerly located in the Subway Terminal Building in Los Angeles and at 55 New Montgomery Street in San Francisco. In these new accommodations there will be a showroom on the first floor, together with ample storage and shipping facilities for crusher and engine parts. This space will have a craneway for handling heavy shipments and there is a driveway for loading into trucks. On the mezzanine floor will be the offices of the Heavy Machinery, Crusher and Process Machinery Divisions. No change has been made in the personnel of the two offices. C. G. Cox, Pacific Coast Manager, and George Lienhard, Installation and Service Engineer of the Heavy Machinery Division will have their headquarters here, together with T. D. Davis, District Manager for the Crusher and Process Machinery Divisions.

Fixtures & Jigs

TO ASSURE UNIFORMITY

On Fulton Diesels jigs and fixtures are applied to every possible machining operation . . . to produce uniform parts . . . an exceptionally well coordinated engine . . . to permit replacements with a minimum of time and expense. Interchangeability of parts on Fulton Diesels means outstanding maintenance economy. It accounts for the low operating and maintenance cost records Fulton Diesels are turning in all over the country!

Fulton 5-BGS diesel being loaded for shipment to U. S. S. R.



Fulton 5-BGS diesels at Osage Iowa Municipal Power Plant

1852 1946 94 YEARS OF MACHINE DESIGN

FULTON DIESELS

FULTON IRON WORKS CO. SAINT LOUIS, MISSOURI

A Little GAMLENOL MAKES THIS BIG Difference IN FUEL OIL

Untreated oil readily reacts with water to form an emulsion, or sludge.

Gamlenol-treated oil does not combine with water; sludge formation is prevented.

POUR a comparatively small amount of Gamlenol into the fuel tank, through fill line or sounding pipe. The effect is immediately noticeable, for Gamlenol dissolves sludge throughout the system, clearing lines, coils, preheaters, strainers, injectors, burner tips. And, its regular use in small quantities prevents re-accumulations. Gamlenol greatly improves atomization and combustion, and increases firing efficiency, which results in more heat and power from every gallon of oil.

Gamlenol is safe, non-explosive, approved as ships' stores. It contains no acid, soda ash, caustic soda, or alkalis.

Ask nearest Gamlen representative for details, or write for Bulletin 455.

GAMLEN CHEMICAL COMPANY

1469 Spring Garden Avenue—Pittsburgh 12, Pa.
195 San Bruno Avenue—San Francisco 3, Calif.
11 Broadway—New York 4, N. Y.

● Service and Stocks in All Principal Cities and Ports

Chronomatic INDICATOR DRUM

WITH SPEED INDICATOR

FOR *Pressure-Time* DIAGRAMS

THAT SIMPLIFY ENGINE ANALYSIS

This Chronomatic Drum, used with our Type 2-CP or 4-HS Indicator, is a convenient and simple means to take diagrams that show change of engine pressure on a time basis. These diagrams—helpful in studying combustion conditions and valve action of any internal combustion engine—are indispensable for Diesel engine analysis. They show ignition lag, point of firing, explosion pressure rise, burning rate, resistance to air and gas flow through filters and silencers, compression, maximum combustion pressure, and other operating factors on which depends the safe and efficient operation of a Diesel engine.

Write for Bulletin 294

BACHARACH
INDUSTRIAL INSTRUMENT CO.
7000 BENNETT ST., PITTSBURGH 8, PA.

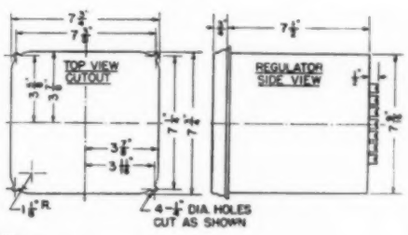
Burlington Synchrostat

(REG U S PAT OFF)

VOLTAGE REGULATOR

Type SR Model SF has a sensitivity of ±2% and is designed to regulate the A.C. voltage of engine generator sets up to 100 K.V.A. 50-60 cycles dependent upon exciter characteristics. Maximum rating of vibrating contacts is 2 amperes at 125 volts.

Inquiries for complete information and engineering service are solicited.



BURLINGTON INSTRUMENT CO.
1503 FOURTH STREET, BURLINGTON, IOWA

NEW 2-CYLINDER STATIONARY DIESEL

THE two cylinder stationary unit shown here is the latest addition to the line of Hallett Diesel engines now in production, according to an announcement by the manufacturer.

Designated as the Model D-2, it is the 4 cycle, solid injection type, and is conservatively rated at 18 horsepower at 1500 rpm. It has a piston displacement of 100 cubic inches, with 3⅞ in. bore and 4¼ in. stroke, and a peak compression of 550 pounds, permitting the efficient use of low grade fuel oils ranging from 44° to 28° A.P.I. gravity. The average fuel consumption when operating on such fuels is .47 pounds per bhp. Maximum speed range is from 600 to 1800 rpm. Fuel is introduced into a cracking chamber, and simple means are provided for adjusting the injection charge, injection timing, and compression ratio to provide high efficiency under varying conditions and in different localities and altitudes.

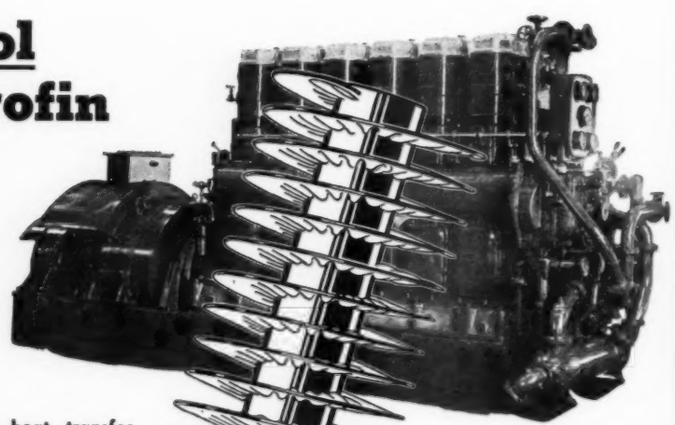
Lubrication is pressure feed by internal gear pump driven from separate helical gears on the cam shaft, oil being fed through the crankshaft to the crank and piston pin bearings. Rocker arm bearings also are pressure lubricated. A stream of oil directed through a relief hole in the top of the connecting rod cools the piston head; while an ample flow through the crank case lubricates the Timken bearings, cam shaft bearings, timing gears, and other mechanism. A filter of the replaceable cartridge type filters the entire flow of oil before entering the lubricating system.

The cylinder head is of the removable, valve-in-head type, assuring easy accessibility. Special adjusting screws enable maintaining correct valve clearances. Large water passages are provided to afford efficient circulation around the valves, injection nozzle, exhaust passages and combustion chamber. Both inlet and exhaust valves are Silchrome steel. Overall dimensions of the engine are: height 22½ in.; length 30 in.; depth from centerline of shaft 8¼ in.; width of base bolt centers 21 in. Weight is approximately 575 pounds.

Small, compact, rugged, and simple to operate and maintain, the Hallett engine is adapted to all power and lighting applications, and provides users of small prime movers the many advantages of efficient, economical and dependable power for all purposes within its horsepower range.

Detailed specifications and engineering data may be obtained by addressing Hallett Manufacturing Company of Inglewood, California

Your Diesel Stays Cool When You Install Aerofin



SPECIFIED BY LEADING ENGINEERS

because:

Metallic bonding and complete tinning give highest practical heat transfer.
Non-corroding metals or special coatings can be supplied where corrosion is a problem.
Furnished in compact, light weight units easy to install in small space.
Removable headers supplied for easy cleaning where required.
Tables and charts are nationally known for accuracy.
Our engineering experience fits the right equipment to the job.

For long, efficient service install Aerofin . . .
good insurance against expensive mistakes.

★
Sold only through Manufacturers of Nationally Advertised Fan System Apparatus
— List on Request —
★

AEROFIN CORPORATION
400 South Geddes Street
Syracuse 4, N. Y.

NEW YORK PHILADELPHIA
CHICAGO CLEVELAND
DETROIT DALLAS TORONTO

The DIRTIER the job—the MORE you need NUGENT FILTERS!

The simplest, safest solution to the complex problem of keeping abrasive dust and dirt out of internal combustion engines is to install Nugent Pressure Filters on oil lines. These modern units offer 20 times greater filtering area, as compared to most filters of comparable size. Thus, if you consider your filtering cost on a *square inch of filtering area basis*, you find that a Nugent Filter is by far the most economical. Write for complete data.

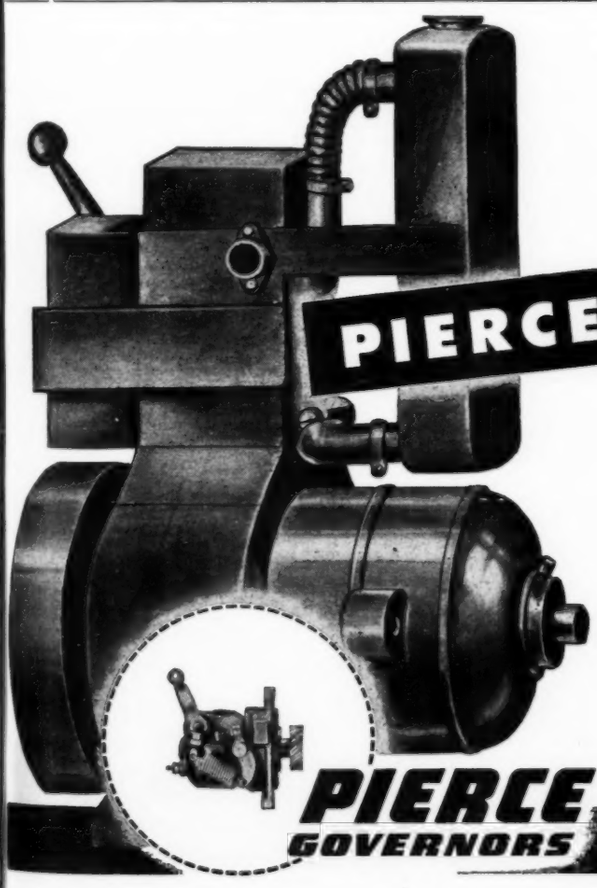
Nugent Filters are used on many Euclid trucks to keep engine oil clean, even on the toughest, dirtiest earth moving jobs.

Nugent Filters

ESTABLISHED 1897

WM. W. NUGENT & CO., INC.
415 N. Hermitage Ave. Chicago 22, Illinois

- Fuel Oil Filters
- Lube Oil Filters
- Lubricating Systems
- Sight Flow Indicators
- Oiling Devices



FOR DIESEL POWER...

PIERCE GOVERNORS

MEAN

★ ACCURATE REGULATION ★ UNFAILING PROTECTION
★ TROUBLE-FREE SERVICE ★ DEPENDABLE LONG LIFE

WHEREVER diesel engines are used—for earth-moving equipment, electric power generation, bus and truck transportation, pumping, hoisting, marine propulsion and the like—Pierce Precision Flyball Governors are proving that *good* governing pays dividends in efficiency, economy and satisfaction.

Pierce Diesel Governors are available in either of two types—driving directly from the fuel injection pump—or independently of the fuel pump shaft. They are unsurpassed for accuracy. They serve for years without trouble or readjustment—often longer than the engines themselves.

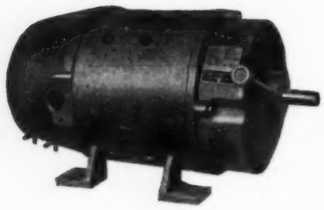
For these reasons, Pierce Governors are standard equipment on many of the world's finest diesel engines—and preferred replacement equipment on thousands more. Wherever *good* governing is necessary, Pierce governing is indicated.

PIERCE GOVERNORS

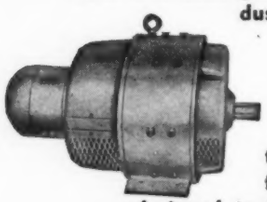
THE PIERCE GOVERNOR CO., INC. 1603 OHIO AVENUE ANDERSON, INDIANA

Manufacturers of Pierce Precision Governors and Sisson Automatic Chokes

GENERATORS AC and DC



Well-known for their rugged design, efficient performance, long life and minimum maintenance, whether powered by electric, gasoline, or Diesel equipment. Backed by over ½ century of manufacturing and designing experience, Kurz and Root generators are now serving industries throughout the world.



DC generator (left) two - bearings, self excited type. Can also be furnished with direct connected exciter. Both AC and DC generators can be furnished in the single bearing, flange-mounted type for special mounting requirements. Ball bearing construction is used throughout. Complete data upon request.

Illustrated are AC generators, only 2 of the many different types developed and designed to fit specific needs and applications. (upper left) two-bearing self-excited type; (lower right) two-bearing, direct connected exciter type.

AC-DC GENERATORS

KURZ and ROOT Company

APPLETON · WISCONSIN

Since 1898

.....and DC motors and motor generator sets

MISOL

THE MILLER DIESEL FUEL ADDITIVE

THIS STARTLING NEW DISCOVERY GIVES YOU CLEAN FUEL SYSTEMS AND PEAK EFFICIENCY FROM TANK TO COMBUSTION CHAMBER.

SAFE AND ECONOMICAL

Descriptive Literature and full information on request

MILLER MANUFACTURING CO.

1100-1110 NORTH 32ND STREET CAMDEN, N. J.

Pollard Appointed Elliott Engineering Manager

E. I. Pollard

E. I. POLLARD has been appointed engineering manager of Elliott Company's Ridgway Division according to a recent announcement by H. S. Pahren, Ridgway plant manager.

With an extensive background in the design of electrical equipment such as large water wheel generators, synchronous condensers and turbo-generators, Mr. Pollard has centered his efforts the last year in the design of a complete new line of Elliott motors and generators.

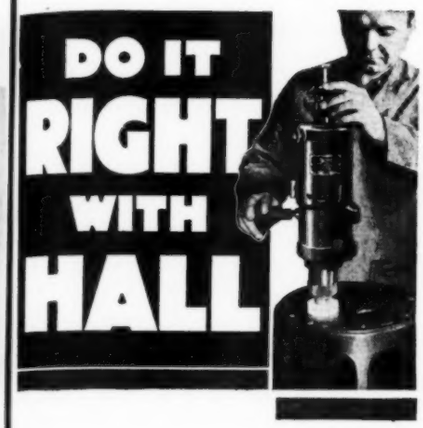
Mr. Pollard is in charge of electrical engineering for the company replacing Mr. Quintin Graham who recently has been appointed assistant manager of the Ridgway Division.

Descaling of Salt Water Evaporators

ADVANCES in methods of descaling salt water evaporators by means of combined chemical and "shocking" or "cracking" treatment are described in a feature article in the July-August issue of Oakite News Service, just published.

Analyzing the procedure used in descaling a 3,000 gal./24 hr.-capacity evaporator installation on a ship recently docking in New York, the article provides details of chemical descaling action, operation hook-up, and an estimate of restoration of heat-transfer efficiency. Of interest to ship repair and maintenance superintendents, it shows how distillate can be increased and salinity lowered by using the chemical descaling and shocking techniques to best advantage.

Free copies of the July-August issue of Oakite News Service may be obtained by writing to Oakite Products, Inc., 22D Thames Street, New York 6, N. Y., publishers.



To get longer, more satisfactory performance and utmost economy from your reconditioned Diesel equipment you've got to service valves and valve seats RIGHT.

By providing the fast, economical means of obtaining original factory standards of precision and finish wherever these parts are serviced, ashore or afloat, HALL equipment does the job RIGHT.

RIGHT NOW ask for complete information on this equipment.

THE HALL MFG. COMPANY

TOLEDO 7, OHIO

ABOVE: Model EDP ECCENTRIC Valve Seat Grinder in use.

RIGHT: EDP on Diamond Dresser Stand supplied with Grinder.

HALL

Newquist Heads Roots-Connersville Sales

RALPH R. NEWQUIST has been elected Vice President in Charge of Sales of Roots-Connersville Blower Corporation, Connersville, Ind., one of the Dresser Industries.

Ralph R. Newquist

A native of Youngwood, Pa., and a graduate of Pennsylvania State College, Newquist has been successively employed by the Reliance Electric & Engineering Company, the Louis Allis Company, and Allis-Chalmers Mfg. Co.

He is a member of A.I.E.E., the Society of Naval Engineers, and the American Society of Naval Architecture and Marine Engineering.

Graver Appoints Sales Manager

WILLARD M. Broxham has been named manager of sales for the fabricated plate division of the Graver Tank & Mfg. Co., Inc. He formerly managed the concern's Philadelphia office and now makes his headquarters at the general offices in East Chicago, Ind.

WANTED

CHIEF INSPECTOR

Preferably experienced in Diesel Engine Parts and Erection to be employed by a large, long established company.

Give complete personal details, education, and work experience in your letter of application. Write Box 167,

DIESEL PROGRESS, 2 W. 45th St., New York 19.

RITCO

DIESEL ENGINE PARTS

• DEPENDABLE
• ACCURATE

RITCO's complete facilities for machining and testing assure superior quality and accuracy in Diesel engine bolts, studs and other parts.

Remember RITCO *for*
SPECIAL BOLTS, NUTS AND STUDS
DROP FORGING • HEAT TREATING
DIESEL ENGINE BOLTS and STUDS
MILLED BODY BOLTS
Let us quote on your specifications.

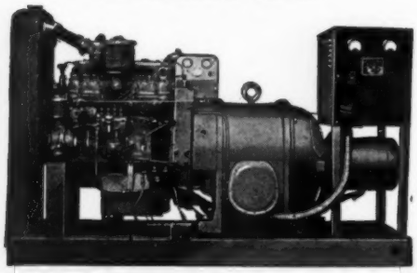
RHODE ISLAND TOOL CO.
148 West River St., P. O. Box 1516
Providence 1, R. I.
SERVING AMERICAN INDUSTRY SINCE 1834

Generating Units

5 K.W. to 100 K.W. A.C. or D.C.

Close regulation of voltage and frequency is an outstanding feature of the generating units we build with either Diesel or gasoline prime movers. We are also equipped to supply any type of instrument panel required.

Manufacturers of engine generator sets for over 20 years.



Duplex Truck Co.
Lansing, Michigan

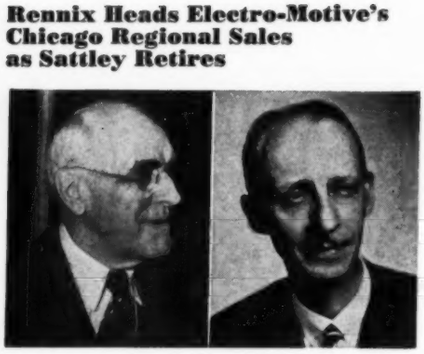
Dee Dee Cee
HYDRAULIC DIESEL INDICATOR

This NEW scientifically designed instrument will meet requirements for instantaneous reading of peak firing and compression pressure. It quickly indicates improper pressures due to defective injectors, faulty fuel pumps, leaky valves, or piston blow-by.

RUGGED AND INEXPENSIVE
Write for descriptive literature

DIESEL DYNAMICS CORP.
233 Broadway, New York 7, N. Y.

Rennix Heads Electro-Motive's Chicago Regional Sales as Sattley Retires



Clyde A. Sattley *Victor E. Rennix*

APPOINTMENT of Victor E. Rennix as Chicago regional sales manager of the Electro-Motive Division was announced recently by C. R. Osborn, vice president of General Motors and general manager of Electro-Motive. Mr. Rennix now is in charge of sales and service and parts activity in the region. In February, 1944, Mr. Rennix joined Electro-Motive as district sales manager of the Chicago region and held that position until his recent promotion. He succeeds Clyde A. Sattley who, back in 1926 when other men his age were content to settle down with their papers and slippers, joined the Sales Department of the Electro-Motive Division of General Motors, La Grange, Illinois, and began his second career.

Tuesday, July 9, marked the close of this successful business venture when prominent railroad executives and friends met at a dinner in the Union League Club to pay tribute to 81-year-old Mr. Sattley, retiring from his position as Chicago region manager.

WANTED

Diesel Generating Set 800-1200 KW, 13,800 volt, 3 phase, 60 cycle. Give age, location, price, complete details.

MECHANICAL EQUIPMENT CO.
861 Carondelet St. New Orleans, La.

McCORD
Class S.F.
LUBRICATORS

A modern lubricator for modern service on Diesel, gas, steam engines and compressors. Supplies dependable cylinder lubrication in metered quantities reducing friction and wear. Capacities: 2 to 24 pt. and 1 to 16 feeds. New catalog on request.

RESULT OF 40 YEARS' LUBRICATOR BUILDING EXPERIENCE

McCORD CORPORATION
DETROIT 11, MICHIGAN
LUBRICATOR DIVISION

HARBOR
INLAND WATERWAY
and
DEEP SEA TOWAGE

MORAN

Established 1860

TOWING & TRANSPORTATION
New York • New Orleans • San Francisco

FOR CLEAN OIL

HILCO

OIL MAINTENANCE EQUIPMENT

HYFLOW OIL FILTERS
OIL RECLAIMERS
AIRLINE OIL PURIFIERS
FOR
EVERY LUBRICATING, FUEL AND INDUSTRIAL OIL PURIFYING PROBLEM

WRITE FOR FREE LITERATURE

THE HILLIARD CORPORATION
122 W. FOURTH ST. ELMIRA, NEW YORK

E. W. Manterfield Joins American Locomotive Advertising Staff

APPOINTMENT of E. W. Manterfield, Jr., to the public relations staff of the American Locomotive Company was announced recently. Mr. Manterfield was deputy chief of the public relations office for the Chief of Transportation, U. S. Army, at Washington from July, 1943, until he was separated from the service as a captain last month.

Prior to entering the Army, Manterfield was assistant director of public relations for Pennsylvania-Central Airlines at Pittsburgh and Washington. He is a graduate of the University of Pittsburgh. Mr. Manterfield will serve on Alco's advertising staff under Holmes Brown, director of advertising, with headquarters at 90 Church Street, New York City.

Hill Releases New Diesels

THE Hill Diesel Engine Company, Lansing, Michigan, announced recently that, having completed a reconversion which encompassed a shift from 100% war production, it now has available a stock of Diesel engines for industrial purchasers.

In this accelerated program of engine manufacture, Hill has concentrated on its R line. These are vertical 4 cycle, solid injection type industrial Diesels, with a horsepower range of 10 to 50 in two, four and six cylinder models. Their kw. range is from 7½ to 30 at 1500 rpm. on DC current and 7½ to 25 at 1200 rpm. on AC current. Similar to those engines manufactured by Hill during the war, they are suitable for use as generating units, power packaged units, pumping units, ship auxiliaries and in various other power applications.

The Hill Company incidentally has enlarged its production facilities and warehousing, and revamped its assembly line for greater efficiency.

For Sale

DIESEL GENERATOR

Busch-Sulzer engine 440 HP. 6 cyl. direct connected to Elliott generator 300 K.W., 360 rpm., 1200 amp., 250 v. D.C. with necessary air bottles, exhaust piping, muffler, lubricating system, with Sharples centrifuge oil filter, and some spare parts.

$7500. as is and where is, subject to demonstration.

Write—
Box 166, DIESEL PROGRESS, 2 W. 45th St., New York 19, N. Y.

PRESSURE, TEMPERATURE, FLOW, ELECTRICAL AND LEVEL MEASURING INSTRUMENTS

UNITED STATES GAUGE

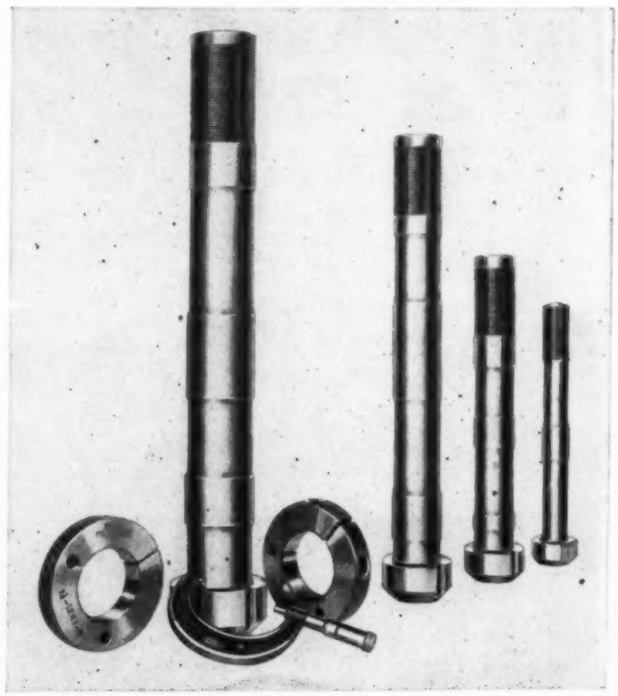
6 out of 10 manufacturers of original equipment specify U.S.G.

DIVISION OF AMERICAN MACHINE AND METALS, INC.
SELLERSVILLE, PENNSYLVANIA (13)

ERIE'S Connecting Rod Bolts, made from Round Bars, with Hot-Forged Heads, represent the ultimate in craftsmanship and economy to an Engine Builder who must meet present day competition.

A-4140 and A-4340 steels are generally used, heat treated after forging, with threads Cut or Ground as specified, to Class 3 or 4 Fit.

Leading Engine Builders have placed their confidence in ERIE as their source for a critical bolt of this type. Send us your specifications.



ERIE BOLT & NUT CO.
ERIE, PA.
STUDS • BOLTS • NUTS ~ ~ ALLOYS • STAINLESS • CARBON • BRONZE

OAKITE SHORT-CUTS to Diesel cleaning

Clean Oil Pre-Heaters This Time-Saving Way

Combustion efficiency through proper atomization in Diesels depends to a certain extent on maintaining fuel oil at correct, uniform temperature. This can best be accomplished only when heat transfer surfaces of oil preheaters are kept free of insulating deposits.

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OAKITE *Specialized* CLEANING
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Hydraulic High Pressure Pump

THE Series 700 Pump is designed for high pressure application for material handling equipment, farm machinery, road making machinery, machine tools, oil well sampling, power transmission, proportioning equipment, and low capacity pressure circulation and delivery functions. This Direct Drive Spur Gear Pump is a small six pound unit operating with a volumetric efficiency in excess of 90% and a mechanical efficiency in excess of 80%. Four models displace from .4 gallons per minute to 9.6 gallons per minute at speeds ranging up to 1750 rpm. against working pressures up to 1000 pounds per square inch.

Standard models are designed for direct motor application, but pumps can be furnished for flange, belt, spline and other drives. Power requirements vary between fractional to 6½ hp.

For further information write The McIntyre Company, 707 Riverdale Ave., Newton 58, Mass.

WANTED

Experienced layout man by manufacturer of high speed Diesel engines. Must be capable of making fast and accurate layouts of engine components and assemblies—also assemblies of engines with associated equipment such as AC and DC generators, oil field power rigs, marine drives, etc. State full qualifications in first letter. Box 163, DIESEL PROGRESS, 2 West 45 St., New York City.

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K.W. —D. C. Generators to 1000 K.W. for Engine, Direct or Belt Drive; Single or Two Bearing Type; Solid or Flexible Coupling.

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Gaskets of all types and materials to give reliable service under all Diesel operating conditions.

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- 165 HP GENERAL MOTORS 2:1, or 2.5:1, or 1:1.25
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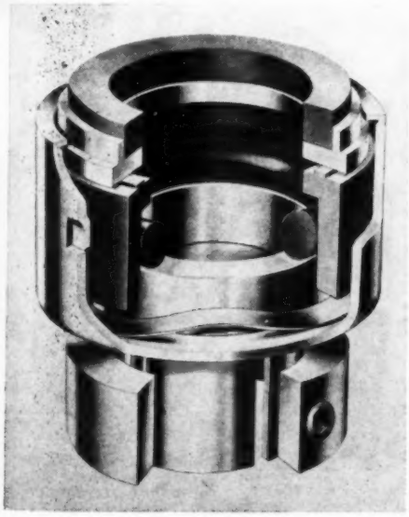
Stewart Elected to Leece-Neville Board of Directors

MADE Vice-President in Charge of Engineering of The Leece-Neville Company, Cleveland, in December of last year, S. Floyd Stewart was recently elected to the firm's Board of Directors. Mr. Stewart fills a vacancy created by the resignation of Van Grant, according to B. M. Leece, President of the 36-year-old electrical equipment manufacturing concern.

The new Director joined Leece-Neville as a Research Engineer 10 years ago, becoming Chief Engineer in 1941. His previous engineering experience was with The General Electric Company, The Wagner Electric Corporation and The Jensen Company.

"Sealol CB" A New Mechanical Seal

A UNIQUE seal for rotating shafts has just been announced by Sealol Corporation. This new "Sealol CB" seal is designed for original equipment or replacement and is said to make stuffing boxes obsolete: it is designed to seal leaking shafts simply, permanently and economically and to exclude all foreign material.

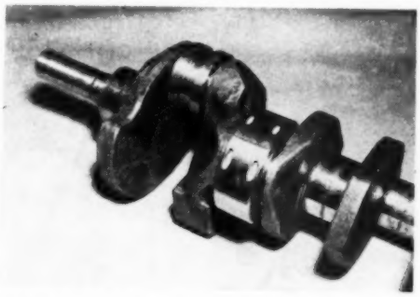


"Sealol CB" mechanical shaft seal.

The "Sealol CB" is packaged as a complete seal, without any loose parts. No skill or special tools are required to install the unit . . . it slides easily into position on the shaft and is locked in place with two setscrews. The only relative movement is at lapped faces and reasonable shaft run-out does not affect the performance of the seal. Available in non-corrosive construction for shaft sizes ½ in. to 1 in., other sizes to order. A descriptive circular may be obtained from the manufacturer upon request. Address Sealol Corporation, 45 Willard Ave., Providence 5, R. I.

New Type Ball Bearing

Top illustration shows the component parts of one divisible race bearing. -Lower illustration shows assembled bearing on crankshaft.



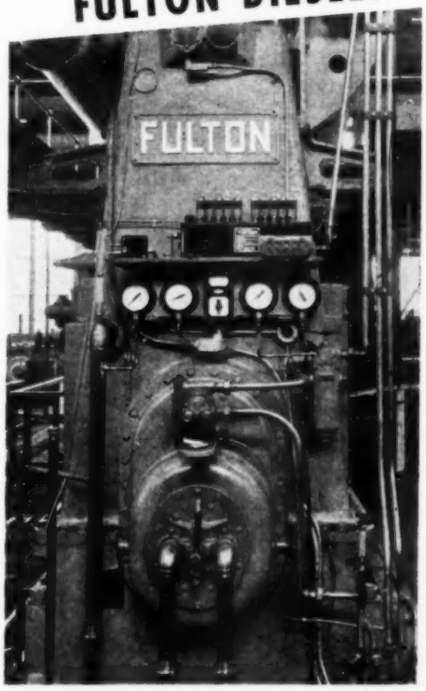
THE Split Ballbearing Corporation has recently issued a new catalogue describing its divisible race bearings. In the past, almost without exception, the construction of ball bearings made their application to anything besides shaft ends impossible. Therefore the benefits of antifriction bearings were not utilized where they were needed most. Now it is possible, even simple, to install ball bearings on crankshafts, camshafts or any other irregular shaft by use of this divisible race bearing. The secret, according to the company is the unique process employed in splitting the bearing races. Making use of a natural law, this fracturing process is so accurate that it surpasses the capacity of any machine tool or toolmaker. This same process is responsible for the greatly reduced cost of manufacture. The process provides a method of cleaving the hardened and otherwise solid raceways in such a manner that when the halves are placed together, the fracture line is imperceptible. Any movement of the faces is made impossible once the specially-designed tapered socket screws are seated.

This interesting catalogue may be had upon request by writing the Split Ballbearing Corporation, Lebanon, New Hampshire.

Stainless Steel Welding Fittings Announced By Tube Turns Inc.

TUBE Turns, Inc., recently announced its line of stainless steel welding fittings which includes many types of elbows, tees, reducers, and flanges. The fittings may be had in three grades of stainless steel which will meet an estimated 95% of industry's standard requirements. Sizes range from ¼ in. to 12 in.

MANZEL LUBRICATORS assure PERFECT CYLINDER LUBRICATION for FULTON DIESELS



• Manzel Lubricators have proved their dependability and efficiency in the exacting service of Diesel lubrication. As a result, the Fulton Iron Works and other leading engine manufacturers rely on Manzels.

Manzel Model 94 Lubricators pump against any pressure usually found in Diesel engines. They deliver the oil drop by drop exactly as needed. The clear view liquid sight feed shows exactly the amount delivered to each friction point on each pump stroke.

Write for Catalog 94-B.

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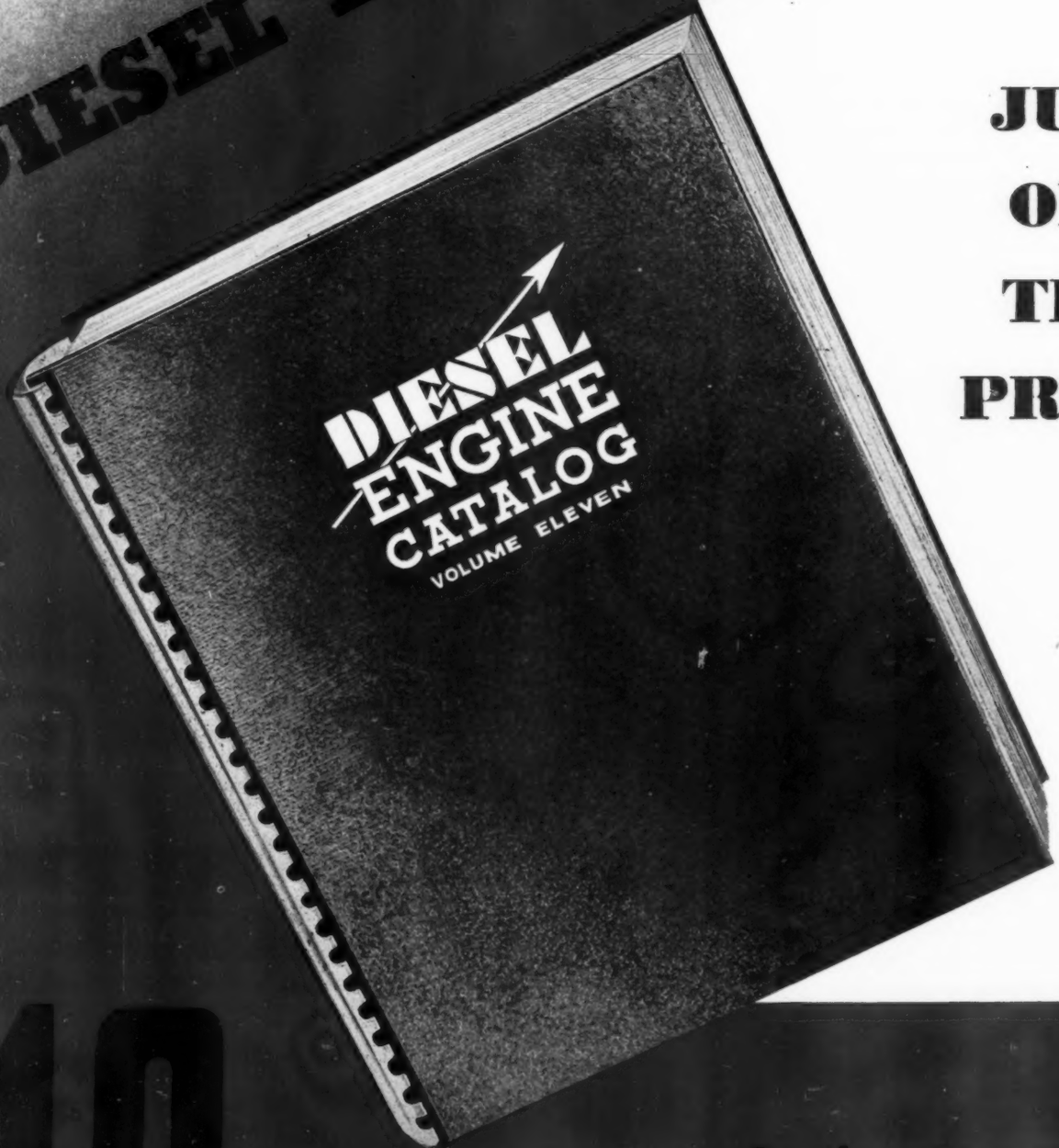

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The Products of 54 Engine Manufacturers. Each engine description is complete and accurate — checked and double-checked by the Manufacturer himself. Illustrations include full-page engine views, lube and fuel system diagrams, also cooling systems — many traced in color.

But that is just the Diesel engine section. The Catalog also includes an accessory section carrying valuable information on the various Fuel Injection Systems, Gear and Chain Drives, Turbo-chargers, Blowers, Magnetic Couplings, all fully described and profusely illustrated.

FOR DESIGN AND OPERATING ENGINEERS AND BUYERS

There is a Market Place Section—a directory of Diesel engines classified as to ratings and speeds with manufacturers' names and addresses — and a Product Directory including accessories, parts, materials and services — all classified as to products. The Market Place tells you at a glance where to find what you want for your engine or plant.

NO OTHER DIESEL BOOK LIKE IT—

Over 500 Pages—

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2. **A large section carries complete illustrated descriptions of Diesel engine and plant accessories.**
3. **The Market Place — a classified directory of Diesel Engines and Accessories.**
4. **Manufacturers' Advertisements—140 pages of Catalog-type copy—informative—helpful.**

REVISED ANNUALLY

The most widely-used Diesel reference book published:—Because the book is revised and brought up to the minute each year, thousands of design and operating engineers, purchasing and sales executives, Diesel students buy the DIESEL ENGINE CATALOG each year and constantly refer to it throughout the year. The 1946 Edition, Volume 11, embodies sweeping changes — new models and types, revised designs——and carries the basic information published in previous editions. Whatever your interest in Diesels is you will find this Edition of the DIESEL ENGINE CATALOG INDISPENSABLE

54 DIESEL ENGINE MANUFACTURERS BUILDING 819 MODELS—

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Anderson Diesel Engine Company
Atlas Imperial Diesel Engine Company

Baldwin Locomotive Works
Buckeye Machine Company
The Buda Company
Busch-Sulzer Bros. Diesel Engine Company

Caterpillar Tractor Company
Chicago Pneumatic Tool Company
Chrysler Motor Company (Dodge Division)
Clark Brothers Company
Consolidated Diesel Electric Corporation
Climax Engineering Company
Continental Motors Corporation
Cooper-Bessemer Corporation
Cummins Engine Company

Enterprise Engine & Foundry Company

Fairbanks, Morse & Co.
Fulton Iron Works Company

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General Motors Corporation
Cleveland Diesel Engine Division
Detroit Diesel Engine Division
Electro Motive Division
Gray Marine Motor Company

Hallett Manufacturing Company
Joshua Hendy Iron Works
Hercules Motor Corporation
Hill Diesel Engine Company (Division of Rogers Diesel & Aircraft Corp.)

Ingersoll Rand Company
International Harvester Company

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Kermath Manufacturing Company

Lathrop Engine Company
Lister-Blackstone Inc.
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Murphy Diesel Company

National Supply Company (Superior Engine Division)
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Rathbun-Jones Engineering Company
John Reiner Company
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R. H. Sheppard Company
Sterling Engine Company
Sun Shipbuilding & Drydock Corporation

Union Iron Works
United States Motor Corporation

Venn-Severin Machine Company

Washington Iron Works
Waukesha Motor Company
Witte Engine Works
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Enter my order today for a copy of the New Diesel Engine Catalog, Volume Eleven, Edited by Rex W. Wadman, for which I enclose $10.00.

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Write for Model L Small Pump Bulletin

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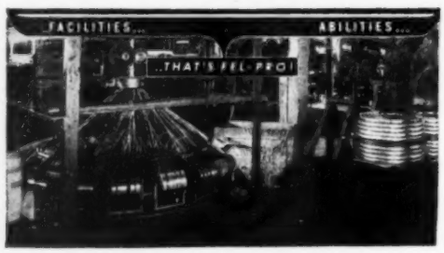

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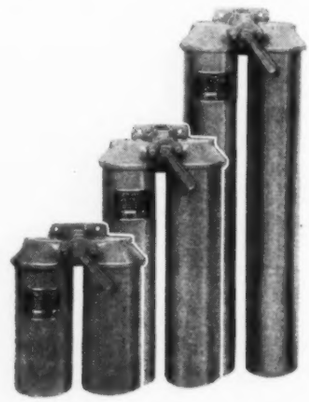
Sealing Materials, Gaskets, Packings, Sound and Vibration-Dampening Materials—Specially Treated, Die-Cut and Fabricated by Fel-Pro.

1857

Hilco Announces New Fuel Filters

THREE new sizes of Hilco Hyflow Duplex fuel oil filters, for bracket mounting to Diesel engines, have been added to the Hilco line of lubricating and fuel oil filtering equipment. The size units available makes it possible to apply these fuel oil filters to engines ranging from 200 hp. to 10,000 hp. Duplex operation permits an uninterrupted flow of fuel to the engine. A feature built into these units includes made-up type throw-away filter cartridges with gaskets attached, so there are no loose parts. The filtering material is a specially-processed cellulose of very uniform density and so packed as to avoid the possibility of channeling. Filter cartridges are all metal covered to avoid the possibility of migration of any filtering material.



Hilco Hyflow Duplex Oil Filters

Write for Bulletin F-135 published by The Hilliard Corporation, 102 West Fourth Street, Elmira, New York.

Cameron Appointed by Parker Appliance Company

APPOINTMENT of D. A. Cameron as Assistant General Sales Manager of The Parker Appliance Company was announced recently by Dan W. Holmes, General Sales Manager of the company.

A native of Pittsburgh, Cameron attended Cleveland public schools and received his degree in Business Administration from Western Reserve University in 1931. Prior to joining The Parker Appliance Company in September, 1941, Cameron was for six years a member of the Cleveland sales force of Williams & Company of Pittsburgh. District Manager in Dayton, Ohio, for Parker during his first three years with the company, Cameron returned to Cleveland in 1944 to assume administrative direction of all the company's branch offices.

PREVENT POWER FAILURE

* ***Install "U. S." Stand-by Electric Plants***

"U. S." builds a complete line of Diesel and Gasoline-powered Electric Plants... ½KW to 125 KW — A. C. and D. C.

Write for information.

U. S. MOTORS CORP.
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OSHKOSH, WISCONSIN

Write for Bulletin

CHECK YOUR FUEL SUPPLY AT A GLANCE

THE LIQUIDOMETER CORP.

DIESEL REPAIR

Our specialty is the repair of cast iron and aluminum castings, adaptable to cracked Diesel engine heads . . . blocks . . . water jackets . . . pumps . . . water-cooled manifolds . . . other industrial castings. Ask about our exchange service to reduce loss of operating time.

WRITE DEPT. A FOR FREE CATALOG

GUTH WELDING WORKS
McPHERSON, KANSAS
Serving the Nation From Its Center

Important OPA News

As we go to press with this issue word comes to us on good authority that steps will be taken by OPA during October to de-control prices of all Diesel engines of 200 horsepower and over. This will be good news to a large segment of our industry and it is hoped that we can report this as a fact in our next issue.

WEST COAST DIESEL NEWS

By FRED M. BURT

THE 64 ft. purse seiner *Freeland*, built by Tacoma Boat Bldg. Co., for Tony Martinis, Everett, Washington, is powered with a 160 hp. Washington Diesel engine, and is equipped with an Intervox radiophone, Intervox direction finder and a fathometer.

THE 64 ft. Trimmer ship *Zimmie*, after coast guard patrol duty, has been rebuilt and streamlined for C. E. Gunderson, president of Gunderson Eng'g. Corp., as an ultra-modern cruiser. Power is supplied by two 200 hp. General Motors Diesels which drive the boat at 22 mph. Renamed *Gee Bee III*, she flies the burgee of Portland Yacht Club.

A NEW type water taxi, the *S&C 39*, in operation on San Diego harbor, first of series of shoreboats, Dean B. Johnson designer, built by San Diego Marine Construction Co., for Star & Crescent Boat Co., is powered with a 175 hp., 6 cyl. Cummins Diesel turning 1800 rpm.

TWO 52 ft. Army salvage tugs purchased by the Meredith Fish Co., Sacramento, Calif., for use as pick-up boats on the Sacramento and San Joaquin Rivers, are powered with 120 hp. Buda Diesel engines.

NEAR Fisherman's Wharf, San Francisco, Oswald Machine Works has just completed one of the outstanding showrooms in Northern California, to display Murphy, Scripps, Sheppard, and Chrysler marine engines, and Joe's reverse gears.

A NEW streamlined 40 ft. cruiser, designed for Harry Hansen of Bellingham, Washington, by Ed. Monk of Seattle, and under construction by Merle Threlkeld, Seattle, will be powered with a pair of Kermath Diesel engines delivering a total of about 180 hp., on 2-to-1 reduction for 18 mph.

POWERED with a 55 hp., 4 cyl. Caterpillar D-4400 Diesel is a new combination boat built

On Auxiliary Drive Shafts, too.

The **HOUDAILLE*** **Viscous Damper**

Reduces Torsional Vibration Efficiently

● The Houdaille* Viscous Torsional Vibration Damper has already proven its efficiency in minimizing both major and minor critical orders of vibration in internal combustion engines, either gasoline or diesel.

But it is not crankshafts alone which suffer from torsional vibration. Many devices outside of internal combustion engines are affected by it. For example, it is frequently caused by a compressor or other auxiliary-drive equipment. And in many cases of this type, the Houdaille* Viscous Damper has been the practical answer to its elimination.

If you have a vibration problem, whether in a crankshaft or auxiliary drive shaft, Houdaille* engineers will welcome the opportunity of discussing its solution with you.

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Each ring is made up of two IDENTICAL interlocking parts that fit together to form a ring without a gap . . . eliminating blow bys. Holds high Diesel compression that means smooth, full flow of power. Tension . . . flatness . . . circularity . . . and close dimensional limits assure perfect seal. Sizes from 1" to 36" . . . for original equipment or replacement in Diesel units, and for pneumatic and hydraulic equipment. Used also for oil rings . . . contracting rings for sealing shafts, bearings, etc. We also make conventional-type rings.

Write for information.

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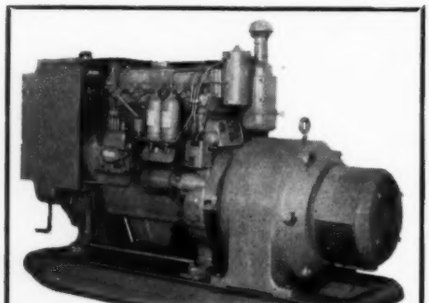

25 KW UNIT 1200 RPM

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GENERATOR UNITS

Also A FEW REBUILT UNITS
10, 20, 25, 75 and 100 kw - AC and DC
QUICK DELIVERY
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by Genoa Boat Wks. for R. Magliulo of San Francisco.

STEEL-HULLED, sampan-type tuna clippers to be built by the Hawaiian Packers, Ltd., Honolulu, will be 75 ft. in length, 16 ft. beam, carrying 4,000 gal. of Diesel fuel to supply twin General Motors Diesels, developing 330 hp.

THE latest addition to the tuna fleet fishing for Sun Harbor Packing Co., San Diego, is the 93 ft. tuna clipper *Sun Hawk*, built by Capt. John Breskovich's Pacific Boat Bldg. Co., Tacoma. Her power is a 400 hp. Enterprise Diesel. Auxiliaries, twin General Motors Diesels developing 12 hp. at 1200 rpm., each direct connected to a 60 kw. Bardco generator.

A $1,000,000 Alaskan expansion program by Standard Oil of California, calls for new tankage and added facilities at practically every point served by Standard, with two new bulk plants on Bristol Bay, and eight on the Yukon and Tanana Rivers.

THE 149 ft. tuna clipper *Queen Mary* has rejoined the San Diego fishing fleet following an overhauling subsequent to 3½ years of Naval service, with an 800 hp. Union Diesel for main propulsion, two 130 hp. Unions for auxiliaries.

THE new 10 knot, 65 ft. x 17 ft. vessel, the *Aloma*, has joined the Humboldt Bay fishing fleet. She is powered with a 175 hp. Diesel engine.

A 165 hp. General Motors Diesel powers a 62 ft. cruiser under construction at the Jensen Boat Yard, Seattle, for John Graham, former Commodore of the Seattle Yacht Club.

BUILT by Hodgson-Greene-Haldeman, Long Beach, the 123 ft. wooden tuna clipper *Sun Queen*, powered with a 540 hp. Fairbanks-Morse Diesel, has been sold to the Sun Harbor Packing Co., San Diego.

DIESEL engine advantages have been proven by the operation of the Puget Sound Black Ball

CRACKED HEADS WELDED
• ENGINES REPAIRED
Satisfaction VALVE SEATS
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For more power and improved performance replace with

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Jahns Quality Pistons are available in all sizes and types for diesel engines. There's a Jahns dealer near to give immediate attention to your requirements. Or write direct for complete information.

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A 225 hp.
38 ft. comb
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Diesel suppli

A NEW 160
engine and a
power. have

ferry *Chippewa* which was converted from steam to Diesel propulsion in 1932, with a Busch-Sulzer, 8 cyl. 2200 hp. engine. In June 1946 she had completed 1,000,000 miles of service and 80,600 hours of operation since the conversion. Speed increase was from 13 knots to over 16 knots.

A 75 ft. yacht being built for Chas. M. Myers of Portland by Grandy Boat Co., Seattle, will have two General Motors Diesels, each of 200 shp.

A 225 hp. Gray Diesel engine will power a 38 ft. combination fishing boat built by Sausalito Boats Wks. for Tony Ferrante, Monterey, Calif.

RECORDS from first three voyages of only Diesel-powered Victory ship, the *MS Emory Victory*, with a 9 cyl. 29 in. x 40 in. Nordberg main engine, rated 600 shp. at 160 rpm., and two 5 cyl. 18 in. x 25 in. Nordberg auxiliaries, each driving an 800 kw. generator shows—total distance—21,270 miles; total running time, main engine—1500 hrs.; average engine speed—152.8 rpm.; average observed speed—15.37 knots; consumption of lubricating oil—24 gal. per day; observed miles per bbl. of Diesel fuel oil—2.26 (main and auxiliary engines.)

A 121 ft. steel tuna boat under construction by United Concrete Pipe Co., Long Beach, will be powered by an 840 hp. Atlas Imperial Diesel with two General Motors Diesel auxiliary units.

UNDER construction by Hodgson-Greene-Haldeman, Long Beach, for an unnamed owner, is a 125 ft. wooden tuna clipper to have an 8 cyl. 650 hp. Superior Diesel as main engine, with two 150 hp. Murphy Diesels for auxiliaries.

THE *Dorothy Ann*, latest addition to the fishing flotilla of Joe Balestrieri & Co., San Francisco, was built by Nunes Bros., Sausalito. The 62 ft. x 17 ft. craft has a supercharged 165 hp. Murphy Diesel engine from Oswald Machine Wks., San Francisco; also a Fairbanks-Morse lighting plant and Exide batteries. Electrical installations by Ets-Hokin & Galvan.

THE 63 ft. *Pacific Queen*, Newport, Ore., fishing vessel built by E. M. Gertulla at his Siletz Boat Wks., Kernville, Ore., is powered with a 150 hp. Murphy Diesel: a 16 hp. Sheppard Diesel supplies auxiliary power.

A NEW 160 hp. General Motors marine Diesel engine and an 8 hp. Lister Diesel for auxiliary power, have been installed in the Astoria, Ore., 50 ft. dragger, *Bristol*, Capt. Elmer Astala, owner.

NEIL W. McLEOD is the new Service Manager for Evans Engine & Equipment Co., Seattle, and will reorganize service and engineering departments before they move into their new building on Lake Union. A former General Motors Diesel technician, Mr. McLeod had a major part in perfecting the first high-speed Diesel engine, the forerunner of the G.M. Series 71, high speed Diesel.

POWERED with a Caterpillar 102 hp. Diesel is the new *Atomic Girl*, skippered by H. Putters. The 40 ft. fantail boat is engaged in albacore fishing.

THE 487,836 gallon capacity oil barge No. 1, of San Francisco's Harbor Tug and Barge Company, is emptied in an average of six hours by two 10 in. Kinney gear-type pumps, each with a 1,000 bbl. per hour capacity, and driven by two 165 hp., at 1850 rpm., General Motors high speed Diesels, through a 3:1 reduction gear.

SPINNING POWER on both sides of zero—means starting that's quick and starting that's sure. Summer or Winter, your Diesel engines respond to Spinning Power. Globe-Union Batteries and Diesel engines are a sure-fire team. Globe-Union Batteries have *Spinning Power.*

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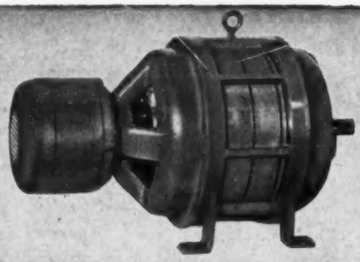

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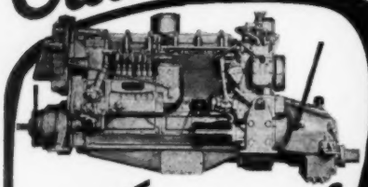

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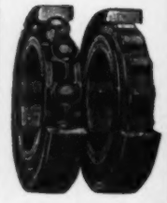

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ADVERTISERS' INDEX

Aerofin Corporation	98
Aircraft & Diesel Equipment Corp.	85
American Air Filter Co.	8
American Blower Corp.	32
American Machine & Metals, Inc., United States Gauge Div.	103
Auto-Diesel Piston Ring Co., The	110
Baldwin Locomotive Works, The	35
Bacharach Industrial Instrument Co., Inc.	97
Bailey Diesel Schools, The	31
Benjamin's for Motors	104
Bolinders Co., Inc.	110
Brodie System	110
Buckeye Machine Co.	84
Burke Electric Co.	104
Burlington Instrument Co.	97
Busch-Sulzer Bros.-Diesel Engine Co.	12
Cities Service Oil Co.	79
Cleveland Diesel Engine Div., General Motors Corp.	56-57
Columbia Electric Mfg. Co.	112
Continental Motors Corp.	18
Cooper-Bessemer Corp.	Fourth Cover
Cummins Engine Co.	15
Cuno Engineering Corp.	68-69
Delco Products Div., General Motors Corp.	13
Detroit Diesel Engine Div., General Motors Corp.	76
Diamond Chain & Mfg. Co.	83
Diesel Engineering & Mfg. Corp.	9
Diesel Dynamics Corp.	102
Diesel Specialties, Inc.	89
Duplex Truck Co.	102
Durabla Mfg. Co.	5
Eaton Manufacturing Co.	2
Electric Auto-Lite Co., The	65
Electric Machinery Mfg. Co.	6
Electro-Motive Div., General Motors Corp.	10
Elliott Company	Third Cover
Enterprise Engine & Foundry Co.	20
Erie Bolt & Nut Co.	103
Erie Forge Company	91
Fairbanks, Morse & Co.	3
Falk Corporation, The	23
Farrel-Birmingham Co., Inc.	30
Felt Products Mfg. Co.	108
Fidelity Electric Company, Inc.	88
Fitzgerald Mfg. Co.	104
Fram Corporation	110
Fulton Iron Works Co.	96
Gamlen Chemical Co.	97
General Machinery Corp.	22
General Motors Corp.,	
Cleveland Diesel Engine Div.	56-57
Delco Products Div.	13
Detroit Diesel Engine Div.	76
Electro-Motive Div.	10
Harrison Radiator Div.	21
Saginaw Malleable Iron Div.	37
Globe Union, Inc.	111
Gulf Oil Corp.	17
Guth Welding Works	108
Hall Mfg. Co., The	101
Hallett Manufacturing Co.	86
Harrison Radiator Div., General Motors Corp.	21
Hilliard Corp., The	102
Houde Engineering Div., Houdaille-Hershey Corp.	109
Illinois Testing Laboratories, Inc.	93
Jahns Quality Piston Co.	110
Kurz and Root Company	100
Lanova Corp.	4
Leece-Neville Co., The	29
Lion Oil Company	95
Liquidometer Corp., The	108
McCord Corporation	102
Manzel Bros. Co.	105
Marquette Metal Products Co.	72
Maxim Silencer Co., The	16
Mechanical Equipment Co.	102
Michiana Products Corp.	90
Miller Manufacturing Co.	100
Moran Towing & Trans Co., Inc.	102
Murray & Tregurtha, Inc.	67
National Bearing Div., American Brake Shoe Co.	11
National Forge & Ordnance Co.	81
National Supply Co., The	1
Nordberg Mfg. Co.	33
Norma-Hoffman Bearings Corp.	112
Nugent & Co., Wm. W.	99
Oakite Products, Inc.	104
Pedrick Piston Rings	27
Penn Machinery Co., Inc., H. O.	112
Petrometer Corp.	110
Pickering Governor Co., The	104
Pierce Governor Co., The	99
Ramberg, Inc., H. W.	89
Rhode Island Tool Co.	101
Ross Heater & Mfg. Co.	82
Saginaw Malleable Iron Div., General Motors Corp.	37
Schoonmaker Co., A. G.	94
Shell Oil Co., Inc.	40
Sheppard Co., R. H.	26
Sinclair Refining Co.	77
Socony-Vacuum Oil Co., Inc.	7
Standard of California	14
Stewart & Stevenson Services	92
Sun Oil Company	38
Sun Shipbuilding & Drydock Co.	34
Texas Company, The	Second Cover
Thompson Products, Inc.	110
Tide Water Associated Oil Co.	19
Tuthill Pump Company	108
United States Gauge Div., American Machine & Metals, Inc.	103
U. S. Motors Corp.	108
Walworth Company	28
Wausau Motor Parts Co.	24
Weston Electrical Instrument Corp.	87
Wilkening Mfg. Co.	27
Woodward Governor Company	25